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TORREYA

A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

JOHN TORREY, 1796–1873

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

MARSHALL AVERY HOWE

AND

PHILIP DOWELL

Volume VII.–8

NEW YORK

1907 –1908

PRESS OF
THE NEW ERA PRINTING COMPANY
LANCASTER PA

THE TORREY BOTANICAL CLUB

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Meetings the second Tuesday and last Wednesday of each month alternately at the American Museum of Natural History and the New York Botanical Garden.

PUBLICATIONS. Bulletin. Monthly, established 1870. Price $3.00 per year; single numbers 30 cents. Of former volumes only 24–33 can be supplied entire. Certain numbers of other volumes are available, and the completion of sets will be undertaken.

Memoirs. A series of technical papers published at irregular intervals, established 1889. Price $3.00 per volume.

Torreya. Monthly, established 1901. Price $1.00 per year.

All business correspondence relating to the above publications should be addressed to Carlton C. Curtis, Treasurer, Columbia University, New York City.

* Died November 16, 1907.

ERRATA, VOLUME 7

Page 8, 6th line from bottom, *for* recurring, *read* recurving.

Page 28, 2d line from bottom, *for* Smith, T. E., *read* Smith, J. E.

Page 32, 25th line, *for* colors, *read* colours.

Page 56, 25th line, *after* by, *insert* 8.

Page 72, 22d line, for *Juncus subterminalis*, read *Scirpus subterminalis*.

Page 197, 2d line from bottom, for *Cheilanthus* read *Cheilanthes*.

Page 213, 17th line, for *Crategus*, read *Crataegus*.

Page 223, 23d line, *for* Kauffmann, *read* Kaufman.

Dates of Publication

No. 1,	for January.	Pages 1–20.	Issued February 7, 1907.
No. 2,	February.	21–48.	February 28, 1907.
No. 3,	March.	49–68.	March 19, 1907.
No. 4,	April.	69–88.	April 15, 1907.
No. 5,	May.	89–112.	May 20, 1907.
No. 6,	June.	113–132.	June 19, 1907.
No. 7,	July.	133–156.	July 19, 1907.
No. 8,	August.	157–176.	August 21, 1907.
No. 9,	September.	177–192.	September 21, 1907.
No. 10,	October.	193–208.	October 18, 1907.
No. 11,	November.	209–224.	November 19, 1907.
No. 12,	December.	225–258.	January 15, 1908.

Vol. 7 No. 1

TORREYA

January, 1907

SOME AFFINITIES OF THE PHILIPPINE FLORA

By C. B. Robinson

While all of the botanical papers which have been issued from time to time by the Philippine Bureau of Science and its predecessors have contributed greatly to our knowledge of the flora of the islands, one of the most recent * contains an introduction of such exceptional interest as to call for special notice.

It is hardly too much to say, that at the beginning of the American occupation information on this subject was drawn almost entirely from two sources, the great collection made by Hugh Cuming in the years 1835–40, and the work of the resident Spanish botanists. Cuming is said † to have taken back with him to England about 130,000 sheets of dried plants, and he also introduced into cultivation a number of the more striking orchids. His collection numbers exceeded 2,400, but they were not exclusively Philippine, some coming from Singapore and the Malay peninsula, and a very few from Sumatra. So far as their distribution between these larger geographical areas is concerned, the facts have long been definitely known; and although many species from this source have been wrongly credited to the Philippines in the past, and occasionally still are, this part of the problem has no longer any difficulties for a careful student. A list further exists purporting to give the locality for each plant, but these data have been shown ‡ to be incorrect in so large a proportion of the few cases where other evidence was available that the list must be held unreliable as a basis for dividing the

* Elmer D. Merrill, New or noteworthy Philippine plants, V. Philipp. Jour. Sci. 1: Suppl. (3) 169–246. 15 Au 1906.

† Jour. Bot. 3: 325. 1865.

‡ Jour. Bot. 24: 59, 60. 1886.

[No. 12, Vol. 6, of Torreya, comprising pages 241–272, was issued December 15, 1906.]

archipelago into its floral provinces. Fortunately all necessity for depending on it is rapidly disappearing.

With the exception of Vidal and Loher, the Spaniards and the collectors other than Cuming have failed to furnish any substantial additional information on this point.

Blanco's *Flora de Filipinas*, of which the first edition appeared in 1837, described many species and even genera as new and identified the remainder with those of other regions. Many of his species and a few of his genera were good, but the descriptions were often incomplete and sometimes inaccurate, and long proved a stumbling-block in the path of European systematists, who attempted to correlate them with the Malayan and continental floras. One of Mr. Merrill's greatest achievements lies in the work done towards clearing up these species, and it may now be said that nearly all of them are at last satisfactorily known.

The most comprehensive treatment of this flora as a whole is the *Novissima Appendix*, published as a part of the third edition of the *Flora de Filipinas*. This is the work of two authors of very unequal merit. Naves, who did most of the monocotyledons, was capable of identifying and enumerating exotic species as Philippine, by the leaves alone or on the reports of the natives, even recording in a few cases orchids from the Andes or western Africa, although he failed to find a majority of those collected by Cuming on his own island. The other author, Fernandez-Villar, was evidently a man of profound ability, but in his determinations he constantly referred Philippine to Malayan or Indian species, wrongly in very many cases. Except where they had been represented in Cuming's and other collections and formed the bases of descriptions, he so far ignored the endemic species that he added a bare half dozen, whereas in the last four years some six or seven hundred have been published as new, and many others so diagnosed will doubtless appear shortly.

It should be remembered that these Spanish authors had either little or no material from outside for comparison, that they sent no specimens to outside herbaria to be named, and that if they preserved any material it has disappeared.

The only Spaniard to appreciate the necessity for such assistance

was Sebastian Vidal, who sent or took to Kew about 4,000 numbers, many of them gathered in the hitherto unexplored Benguet region of northern Luzon, whence have come so many of the most interesting recent discoveries.

These and the other rich collections in the Kew herbarium enabled Rolfe,* in 1884, to publish what has been till now the only important paper upon the affinities of the Philippine flora.

In the meantime explorations elsewhere have done much to reveal the secrets of the most nearly related regions. This is notably true of Henry's large collections in central and western China and in Formosa, and of Koorders' work in Minahassa, or northeastern Celebes. But the results of Loher's splendid Philippine collections have never been published, except as regards occasional groups.

The great energy with which exploration has been carried on in many districts in the Philippines and the large quantity of material thus obtained, have made it possible for Mr. Merrill to preface the paper here noted with a discussion of two sets of affinities, those with Celebes on the south, and those with Formosa, China, the Himalayas, and Japan on the north and west.

From his enumeration it appears that there are now over 50 species known from the Philippines and Celebes and nowhere else, and another 25 that extend from the Philippines through Celebes to more distant islands. Several further cases are cited where Philippine species have striking affinities with those of Celebes but fall short of specific identity. It may be worth noting that although some of these belong to the southern Philippines, others are widely distributed throughout the archipelago.

Far different is the case with the northern or semi-tropical affinities, for these with few exceptions are found in the flora of the Benguet and Lepanto-Bontoc provinces, the mountainous regions of northern Luzon. This list is so much more complicated in its nature that it is not easily summarized; but again over 50 species are known to be specifically identical with those of more northern countries, and an equal number of additional cases are cited where affinities lie definitely in this direction.

* Jour. Linn. Soc. **21**: 283–316. *pl. 10.* 1884.

The large collection made for the New York Botanical Garden by Mr. R. S. Williams bears similar testimony to these facts; and the present indications seem to be, that when northern Luzon is fully explored, the most numerous cases of specific identity may be as would be expected with Formosa, but the more interesting and instructive cases with the hill district comprising part of southwestern China and northeastern India.

Bornean relationships are not discussed, owing doubtless to the less advanced state of exploration in Mindoro and Paragua than in Luzon and Mindanao, but these should prove equally interesting.

New York Botanical Garden.

COASTAL-PLAIN AMBER

By Edward W. Berry

Recent discussions of the occurrence of amber in the Cretaceous deposits of the Atlantic coastal plain seem to have overlooked the fact that amber was well known to some of the earlier geological explorers in this region and is frequently mentioned from a number of different localities. Professor John Finch, an Englishman, who visited southern Maryland as well as parts of the intervening region northward as far as Marthas Vineyard during the first quarter of the last century, seems to have been a keen observer and close thinker. On the eve of his departure for England he read a paper before the Philadelphia Academy which was subsequently published in the *American Journal of Science* under the title "Geological Essay on the Tertiary Formations in America." * Aside from the distinction of casting discredit on the term "Alluvial" which had been applied to the coastal plain deposits collectively, his essay contains a number of interesting suggestions such as that relating to the extension under Long Island of the equivalents of the Plastic clays of New Jersey. The present Cretaceous deposits are included in his "Plastic Clay and Sand Formation" which he considered of Tertiary age, one of his reasons for this being the presence of amber which he assumed

* Amer. Jour. Sci. 7: 31-43. 1824.

to be of the same age as that of the Baltic. In speaking of the amber, which was my reason for mentioning Finch's work, he says that the lignites of the Plastic Clay and Sand Formation usually contain it, and among the localities mentioned are Marthas Vineyard, the Delaware River below Bordentown, N. J., Cape Sable, Md., etc. Some of these localities Finch visited, some he reports on the authority of Troost, Vanuxem, and others.

In a recent paper * the writer mentioned amber as constituting one of the characteristics of the laminated lignitic beds which mark the transition to the typically marine deposits of Upper Cretaceous age. These laminated clays and sands constitute what is known as the Magothy Formation, the name having been suggested by the typical exposures at Cape Sable on the Magothy River in Maryland, the classic American amber locality, first described by Troost nearly one hundred years ago (1821) in the third volume of the *American Journal of Science*.

It is not intended to attempt an exhaustive enumeration of the older literature, which has already been done †; it will suffice to point out that scattered through the works of Vanuxem, Morton, and other contemporary writers will be found quite a number of references to the occurrence of amber, most of which seem to have heretofore escaped attention.

In studying these Cretaceous deposits during the past few years the writer has observed amber at a number of points, of which the following may be enumerated. In New Jersey, amber was found at Cliffwood Bluff on Raritan Bay; at the pits of the Cliffwood Brick Company on Whale Creek; in the pits about one-fourth of a mile west of the Long Branch Railroad on Whale Creek, where there is little lignite associated with it; near Morgan on Cheesequake Creek, where the amber is very plentiful and the drops are of considerable size. On the Delaware River amber is disseminated through the Magothy sands in the vicinity of Kinkora, N. J.

In Delaware, the sands along the Chesapeake and Delaware

* Ann. Rep. State Geol. N. J. 1905: 137. 1906.

† Hollick, Amer. Nat. 39: 137–145. 1905.

Canal near High Point contain scattered drops of amber; and here again it is not in immediate association with lignite, although lignitic layers are near at hand. This locality is believed to be the only one mentioned in this connection which is not new, it having been described in 1830 by Morton, who records lignite and teredo-bored logs and amber beneath sands with marine molluscs, found during the digging of this canal. Farther south, amber occurs in the Cretaceous near Blackmans Bluff on the Neuse River and near Parker Landing on the Tar River, both localities in North Carolina. At nearly all of these localities charred wood seems to be present in more or less abundance, as was noticed by Hollick in connection with the Staten Island deposits. Extensive search in the Raritan Formation of New Jersey during the past summer, while disclosing much lignite and some charred wood, failed to yield any traces of amber, which seems to be so common a feature of the overlying Magothy beds.

MARYLAND GEOLOGICAL SURVEY,
BALTIMORE, MD.

SHORTER NOTES

TWO UNDESCRIBED SPECIES OF COMOCLADIA FROM JAMAICA.—**Comocladia cordata** sp. nov. A tree, about 15 m. high, glabrous throughout. Leaves about 2 dm. long; leaflets about 13, ovate to oblong-lanceolate, firm in texture, dull green, slightly paler beneath than above, strictly sessile, entire-margined, cordate at the base, acute or short-acuminate at the apex, 5–9 cm. long, 2.5–4 cm. wide, the veins diverging from the midvein at nearly right angles and curving upward; lower leaflets smaller than the upper ones, the pairs distant; panicles as long as the leaves or shorter, about 8 cm. broad, their branches very slender; flowers numerous, purple, 1.5 mm. wide; pedicels filiform, 1–3 mm. long.

Rocky wooded hill, Troy (Britton *640*). Nearest to *C. integrifolia* Jacq.

Comocladia velutina sp. nov. A tree, 6 or 7 m. high, the young twigs, foliage and panicles densely brown-velutinous. Leaves about 2 dm. long; leaflets about 13, oblong, rather firm in texture, paler beneath than above, blunt and rounded at the apex, truncate or subcordate at the base, slightly repand on the

margin, 2–7 cm. long, 4 cm. wide or less, very shortly petiolulated, the lower pairs much smaller than the upper; petiolules 2 mm. long; panicles as long as the leaves or shorter, the branches slender; flowers dull crimson; fruits oblong, very shortly stalked, 1 cm. long, 6 or 7 mm. in diameter.

Great Goat Island (Harris *9255*). Perhaps nearest related to *C. pubescens* Engler.

N. L. Britton.

A new blackberry from Massachusetts and Rhode Island. — On August 1, 1906, I found a new blackberry in Rehoboth, Massachusetts. It is decumbent but has a large, strong, angled stem, is fearfully armed and well branched. The station is near the Seekonk line on the trolley from Providence, R. I., to Taunton, Mass. It is abundant over an acre or more of rich land, now in pasture, and holds its own well in spite of the vigorous trimming given it by the cows. But I found no more in that locality except one plant in Seekonk. Two days after, however, I found it at Rocky Point, R. I., near the junction of the electric roads. Here it was very abundant, just ripe, and the excursionists found it good eating. The pastures and mowings, unused but "for sale," make it a good home. The fruit is abundant, of good size and flavor. Care is required, however, in walking in such lots, for the strong branches are continually tripping one, and the strong prickles take hold. For four miles it occurred along the road to Providence, the last station being in a pasture. Darkness stopped the search. Afterward I found it in Portsmouth, R. I.; in Massachusetts, at Fairhaven, near the garden of H. H. Rogers, the oil magnate, and very abundant on his grounds, also at Wilbur Point; at Mattapoisett, on the electric road, while waiting at a switch west of the village; in Bridgewater, in a pasture near the Normal School; and in Plymouth, beyond Hotel Pilgrim.

Rubus multispinus sp. nov.

New canes. — Stems green, large and strong, often 0.375 inch in diameter, 4 to 8 feet long, nearly erect at first, soon decumbent and partly trailing, with numerous long branches, glandless but slightly pubescent, none noticed tipping. Prickles for-

midable, numerous and large, about 13 to an inch of stem, 0.25 inch long on the main axis and set at a pronounced backward slant, smaller on the branches and often hooked, set in lines more or less regular on the angles. Leaves large, mostly 3-foliolate, many or all on the main axis and often some on the branches 5-foliolate, yellow-green, with abundant appressed hairs on the upper surface, quite pubescent below. Leaflets broad, the middle one often nearly orbicular, short-pointed, the side ones also broad and more or less 1-incised, or if divided the side leaflets rhomboidal and pointed at each end and the basal ones similar but smaller; outline finely somewhat doubly serrate-dentate, otherwise nearly entire. Petiole and petiolules large, grooved, somewhat pubescent, strongly armed with three rows of numerous very stout and hooked prickles, which are continued into the point of the leaf, the petiolule of the middle leaflet often 1 inch long, the other leaflets nearly or quite sessile.

Old canes. — Stems greenish, stout, hard, prickles intact. Second year's growth consisting of short fruit-branches from 7 inches to 2 inches long, well graded, tipped with inflorescence, one from each old leaf-axil, axis of branch zigzag, angled, fine-hairy, armed with short, stout, hooked prickles. Leaves not numerous, the lower 3-foliolate, the upper unifoliate; leaflets rather broad, very coarsely serrate-dentate, often incised-dentate, the unifoliate ones often 2-incised, similar in color and pubescence to those on new canes. Inflorescence cymose-racemose, of 4 to 8 flowers on stout pedicels, fine-hairy, well armed with hooked prickles. Flowers not seen. Fruit ripening early in August, abundant, short-cylindric with large drupelets; a large one measuring 0.75 inch high by 0.69 inch broad and having 30 drupelets, each 0.22 inch in diameter. Type station: Rocky Point, Rhode Island.

In open dry places.

This species has the appearance of a high blackberry in its leaves and angled stem, round stems being commonly characteristic of recurring and decumbent forms. It trails over walls and fences and alone makes a low hedge of the densest kind. The fruit is ripe considerably earlier than that of *R. Andrewsianus* Blanchard and much earlier than that of *R. alleghaniensis* Porter.

W. H. Blanchard.

Westminster, Vermont.

REVIEWS

Juvenile Forms and Flower Maturity *

During a residence in West Australia, Diels found the relation between vegetative growth and generative maturity subject to change and became acquainted with the conditions that correspond to the phases of these changes. He found a large number of cases in which flowering occurred in juvenile forms. A search in the literature showed that this "abnormality" is far-reaching and calculated "to throw light upon a new side of form-diversity in the plant kingdom."

His book does not attempt a complete enumeration of such cases but endeavors, by typical examples, to illustrate the many-sidedness of the question.

The first chapter, entitled, "*Die Bedingtheit der Blütenreife*," discusses various explanations that have been offered as to the conditions of flowering. The older theory of Moebius (1847) was that every plant species which, through heredity, possesses fixed characters, produces flowers at a definite age or phase of its development. Diels, however, agrees with the view more recently expressed by Klebs (1904), "that flower formation by phanerogamous plants presents the same problem in principle as does the sexual reproduction of algae, or the fruiting of the higher fungi. * * * "I hold," says Klebs, "that a quantitative increase of the concentration of organic material with all its physical and chemical consequences plays an important rôle in the transition from growth to reproduction."' "The external circumstances," says Diels, "either inhibit or accelerate, according as they interfere with or favor, the internal conditions necessary to flowering." Experimental researches on the problem have been few, but Diels believes that a new review of the cases hitherto published of flowering in a very early developmental stage will not be without its value.

Chapter II, "*Das Verhältniss der Blütenreife zur vegetativen Entwickelung in seiner Wandelbarkeit*," gives citations from literature, presenting cases illustrating the relation of flowering to

* Diels, L. Jugendformen und Blütenreife im Pflanzenreich. Pp. 1-130. *f. 1-30.* Berlin: Gebrüder Borntraeger. 1906.

vegetative development in its changes. The cases cited indicate that there is a "vast independence of generative maturity and vegetative growth. Of course a definite 'nutrition-minimum' is absolutely necessary. Beyond this, the way for generative maturity, flowering (*Die Blütenreife*), arises independently. Every favoring constellation is able to induce it, even though vegetative development be insignificant, and though the age be juvenile. Practically, all cases of 'early blooming,' or on the other hand of 'nanism,' signify how flowering is favored 'by dryness or by the disturbance of the nutrition conducive to growth.'"

In Chapter III, "*Helikomorphie und Blütenreife bei heteroblastischen Pflanzen*," the author refers to Goebel's classification of development into "heteroblastic," where the differences between the configuration of the plant at different stages in its vegetative development are very small, and "homoblastic," where these differences are large. Goebel, in his "Organography," has already pointed out that no sharp line can be drawn between homoblasts and heteroblasts. Juvenile forms (*Jugendformen*) and subsequent forms (*Folgeformen*) have been recognized. Diels proposes to apply to both the general term "helikomorph." "I call a form a '*helikomorph*,'" he says, "which appears at a definite phase of vegetative development, that is, at a definite (relative) age (Gr. ἡλικία = age)." The term signifies, in general, the vegetative configuration dependent upon the phase or age.

Helikomorphs are classed as: 1. Heteroblasts with arrested primary leaves; 2. Heteroblasts with arrested subsequent leaves (*Folgeblättern*); 3. Heteroblasts with helikomorphs of indeterminate characters. The greater portion of the book (pp. 23–108) is occupied with illustrations of the various classes, under the subheads, (*a*) cases conditioned by external conditions (*exogener Bedingtheit*), including seasonal dimorphism; (*b*) cases whose conditions are unknown.

The phylogenetic significance of helikomorphs is discussed in Chapter IV. "After the attainment of a certain minimum of vegetative preparation, flowering can occur in very diverse phases of development and bring about the termination of vegetative unfolding."

"When this happens within heteroblastic species or genera, then there follows a corresponding difference in the entire morphological expression of the individual forms. We rank these forms as individual variations if observation or experiment demonstrates their connection with the 'normal.'" (*Limosella* presents an example of this.) "We call them species if such experience is wanting. But often these standards are uncertain." One recalls very distinctly an example in the case of *Campanula rotundifolia*. Of their early-blooming form, Goebel rightly says, they would, "in another botanical district and occurring in larger number, be considered without hesitation as a different species from *Campanula rotundifolia*. There is not the slightest doubt but that in fact many so-called 'species' bear the same relation to other species as the Schleissheim *Campanula* (p. 86) does to the 'normal' plants, that they also stand mutually in the relation of helikomorphic forms."

"Often phase-forms prove themselves to be 'epharmons' (*Epharmosen*). Theoretically they must quite frequently begin as such, because the relation between vegetative growth and reproduction is so labile, and because external conditions are in continual change."

"In each case these epharmonic phase-forms will endure as long as the determinative conditions remain nearly similar. They may, indeed, exist under circumstances of very long duration. And thereby they acquire the possibility of becoming fixed through heredity and of losing more and more the primary strict dependence upon external circumstances."

"This case has found realization in many similar forms. * * * The Australian acacias form their phyllodes even in our houses. I have seen examples of *Eucalyptus Risdoni* that escape from culture of European gardens and bear inflorescences as in their home locality."

"Heredity has also been demonstrated in the case of the 'seasonal dimorphic' species. Von Wettstein has cultivated *Euphrasia Rostkoviana* and *E. montana* through three years in the botanical garden at Prague under entirely similar external conditions. The two plants proved themselves fully constant in

all their characters, in their whole behavior." (Ber. Deutsch. Bot. Ges. **13**: 307. 1895.) "Now if Von Wettstein's plausible assumptions concerning the established causes of this dimorphism are correct, then even the state of heredity is here a relatively very young epharmon (*Epharmose*): for only since the development of an alpine habit (*Alpenwirtschaft*) through regular mowing would the effective forces have been in action. If only a phylogenetically considered short period suffices in this case to fix the form as hereditary, by how much more would nature itself, which operates over such immeasurably long periods, be in a condition to do it. Through heredity numerous helikomorphic structures obtain that independence which establishes new phyletic courses for their posterity. They become, then, 'phylembryos' of new developmental courses. Their leaf-form, fixed in a definite direction, undergoes either epharmonic or autogenous variations, a new strain is developed out of the former phase-form of the old stock."

Chapter V treats of similar phenomena in the animal kingdom, and Chapter VI is a résumé of the preceding chapters. The following is a free translation of Chapter VI, with omission of the examples cited:

"The generative maturity of plants is not unchangeably bound up with a definite stage of vegetative development. Of course it presumes a certain minimum of previous vegetative work; if this is exceeded, however, there follows *a broad zone of variation for the appearance of the flowers.* The regulation of this variation takes place by means of complex and diverse conditions. *External circumstances* have an important share in it, in the case of cryptogams (Klebs) as well as in the case of flowering plants. Of this we know but little; but it is manifestly evident that *dryness and a qualitative variation of nutrition favor flowering, opposite conditions are unfavorable.*

"The vegetative ontogeny of plants is consummated through the coöperation of autogenous and external (*exogener*) factors. The ground work comprises diverse potentialities. Thus it postulates no rigid configuration. At first the environment is rather 'the determining factor as to which of the various possible

developmental forms becomes realized.' *This regulation by means of the environment is clearly realized in the case of heteroblastic ontogenesis.*

"As in the case of flowering, the insight into the associations which we have hitherto obtained is rather limited. But we see that the organization of subsequent leaves (*Folgeblätter*) becomes more abundant if heat and moisture are increased. And we recognize a restriction in this respect by shortening the growth period, by dryness, and by a lowering of the temperature.

"Thus ontogeny varies with the quality and degree of external factors. The finished figure of the organism is the product of vegetative ontogeny and of flower-maturity: and *both factors are variable.*

"And furthermore their variability is not of the same kind nor similarly ordered. Of course the vegetative form-development ceases for the most part with flowering; but that is a stage, however, where the two courses of development, the vegetative and the generative, are indissolubly connected. Otherwise they are free and independent of each other. Their relation is capable of every variation. The leaf-succession in its phase (heliko-morphy) varies after its own fashion. Flowering varies in its own way.

"In this combination of two variable factors into the unity of the flowering form, lies a powerful impetus to the increase of form-diversity in the plant kingdom. For the circumstances that help to regulate the leaf-succession and flower-maturity vary with the change of climate in time and place. In their ultimate effects they produce the geographically local races (*Arten*) and in the course of time favor the development of new species. Their product attains to heritability, and thereby new strains with new possibilities become established.

"In this relation of consecutive vegetative stages and flowering, it is expressed with clear emphasis how endlessly variable form is in the plant kingdom. Even the few external factors that we perceive, produce an interminable maze of possibilities. We are led indeed to the confession to which Klebs was led in another connection: 'The typical or customary development

signifies only a small, limited portion of the complement of possible forms.' Such utterances, often enough already expressed, are, notwithstanding the clear conception of species of our day, still far remote from fruitful effect."

The book, on the whole, is very suggestive along several lines. It the first place, it shows how possible it is to arrive at new and possibly important results merely by a reëxamination and reconsideration of the rich material already collected both in herbaria and in published literature. In the second place, it emphasizes the great desirability of collecting and preserving in herbaria unusual or abnormal forms, as well as so-called "typical" specimens. In the third place, it gives emphasis to the value and absolute need of experimental pedigree culture, at least as ancillary to morphological and systematic work, for the reason that origin of species is more a physiological than a morphological problem, and can never be solved by employing alone the methods of comparative anatomy.

Finally, added importance is attached to the "heliokomorphs" as material upon which selection may act in the development of new groups of the rank of species. In this connection, also, the question of the heritability of acquired characters is forced once more to the front.

The burden of proof still lies with those who deny that species of plants as well as of animals, are formed in more than one way. As has been recently often stated, it is only by a combination of ecological and physiological studies that we may hope for a proper interpretation of the facts of comparative anatomy and ultimately of the method of organic evolution.

C. STUART GAGER.

Postelsia, reviewed in TORREYA 6: 250. December, 1906, may be obtained from Professor Josephine E. Tilden, University of Minnesota, Minneapolis, Minn.

PROCEEDINGS OF THE CLUB

November 13, 1906

The meeting of Club was called to order by President Rusby at 8.15 o'clock, at the American Museum of Natural History. Thirteen persons were present.

After the minutes for October 31 were read and approved, the name of Dr. H. E. Hasse, of Santa Monica, California, was proposed for membership.

The resignation of Mrs. Ada Watterson Yerkes, Cambridge, Mass., was read and accepted. On motion the secretary cast the vote of the club electing Dr. H. E. Hasse to membership.

The resignation of Dr. N. L. Britton, as chairman of the program committee, was read and accepted, and the chairman appointed Dr. M. A. Howe as chairman of that committee. The other members are Professor L. M. Underwood and Mrs. E. G. Britton.

The following scientific program was presented:

"Account of a Collecting Trip in the Adirondacks and in the Catskill Mountains," by Dr. Per Axel Rydberg. Dr. Rydberg gave an interesting account of botanical field studies and collecting in the regions mentioned, giving special attention to the blackberries. The talk was richly illustrated by herbarium specimens collected on the trip.

Dr. Augustine Henry, of London, who was visiting New York, gave a very interesting account of some features of the flora of China, pointing out its richness and great diversity, which are correlated with diversity of topography and climate, and emphasizing both the slight amount of collecting that has as yet been done there and the important results to be obtained by ecological and systematic studies in that region. As an illustration he called attention to the fact that several genera recorded in existing manuals as monotypic are known to be represented in China by several distinct species.

Adjournment was at 10 o'clock.

C. Stuart Gager,
Secretary.

NOVEMBER 28, 1906

The Club met at the museum building of the New York Botanical Garden, at 3:30 p. m. In the absence of President Rusby, Dr. L. H. Lighthipe was called to the chair. Twenty-two persons were in attendance.

The minutes for November 13 were read and approved, and the following names were presented for membership:

Ulysses O. Cox, Terre Haute, Ind.

Harold W. Pretz, 368 Union St., Allentown, Pa.

The amendment to Article XIV of the Constitution relating to annual dues, presented at the regular meeting of the Club on October 31 and published in the weekly Bulletin of the New York Academy of Sciences and Affiliated Societies for November 19, 1906, came up for discussion. After a brief discussion it was voted to lay the motion on the table.

The secretary read a communication to the president of the Club from the member for botany of the committee of the New York Academy of Sciences appointed to arrange for an exhibit to be held at the American Museum of Natural History, on December 28 and 29, to illustrate recent advancement in different departments of science. The Club was invited to send material for the exhibit. On motion the secretary was appointed to arrange for the Club's participation in the exhibit.

On motion it was voted to omit the second regular December meeting of the Club which would fall on the 26th of the month.

The following scientific program was presented: "Some Costa Rican Orchids," by Mr. George V. Nash.

The speaker referred to the little-known country of Costa Rica and the desirability of securing material from there. Mr. Wm. R. Maxon, of the United States National Museum, during the early part of the year, made an exploration in this region in the interests of the New York Botanical Garden and brought back with him not only a valuable collection of herbarium material but also a large collection of living plants, representing mainly the orchid, fern, bromeliad, and cactus families. This material, owing to the care taken by Mr. Maxon in collecting and packing it, arrived in excellent condition. A great many orchids

were among the lot, and several of these have already flowered, revealing new and interesting species. Living material is especially desirable in this family of plants, as the color and shape of the flowers play a large part in their classification, and these characters are difficult to determine from dried material. The genera *Pleurothallis*, *Elleanthus*, and *Zygostates*, have each already yielded one species new to science. The new species of *Zygostates* is a particularly interesting discovery, as it not only proves to be a species hitherto unknown but also brings into the flora of North America a genus known formerly only from Brazil and Peru. Among other things worthy of note are: *Warscewiczella Wendlandi discolor*, originally described and known only from Costa Rica; *Maxillaria iridifolia*, found throughout tropical America but certainly differing much in general appearance from the other members of the genus; and *Cycnoches Rossianum*, originally described from a plant that flowered in cultivation in the Garden of Mr. Ross, at Florence, Italy, in 1889. The origin of this plant was unknown, and it is now interesting to have its home revealed by this collection of Mr. Maxon's. The remarks were illustrated with living plants of the species referred to, supplemented with herbarium specimens, drawings, and material preserved in formalin.

"The Sedges of Jamaica," by Dr. N. L. Britton.

Dr. Britton exhibited specimens of all species of Cyperaceae known to occur on the island of Jamaica, including several species new to that island, collected by Professor Underwood or by himself during a visit to Jamaica in the month of September. He remarked on the distribution of many of these species and on the fact that a number of them are found in the West Indies, only in Jamaica, their further distribution being in Central and South America. This distribution of these sedges is paralleled by that of a considerable number of species in other families, so that the South American relationship of the Jamaica flora is more intimate than that of Cuba, Hayti, or Porto Rico, and it is suspected that this may be an indication of a former land connection between Jamaica and the continent to the west or southwest. Dr. Britton's paper included a complete enumeration of the species now

known, together with diagnostic keys for their determination, and as much of their synonymy as relates to Jamaican records. No undescribed species were found, but the collections made by recent explorers added a number to those recorded by Mr. Clarke in his monograph of the West Indian Cyperaceae, published in the second volume of Professor Urban's "Symbolae Antillanae."

"Exhibition of Photomicrographs of North American Woods," by Dr. C. Stuart Gager.

Numerous specimens were shown from a collection of photomicrographs of cross-sections of North American woods, recently acquired by the Garden from Mr. James A. Weale, of the firm of Williams, Weale & Co., of Liverpool, England. These photomicrographs are all enlarged ten diameters, thus facilitating comparison. They are of very superior quality, so that many finer elements of the histology of the various woods can be demonstrated under a lens with nearly as great satisfaction as from the original sections. They possess the advantage of being less fragile than the sections themselves and of serving better than these for purposes of demonstration before classes and otherwise. The collection contains representations of practically all North American species.

By way of comparison, specimens were shown of Hough's "American Woods" and of Nördlinger's "Holzquerschnitte."

The Club adjourned at five o'clock.

C. Stuart Gager,
Secretary.

NEWS ITEMS

Dr. John A. Shafer has started on a collecting trip, for the New York Botanical Garden, to the West Indian island of Montserrat.

Dr. Marshall A. Howe returned to New York on January 30 from a botanical expedition to Jamaica. Six weeks were spent in collecting and studying marine algae in the vicinity of Kingston and Montego Bay.

Mr. E. S. Steele, of the United States National Museum, spent a few days, about the first of January, studying the herbarium material in the New York Botanical Garden.

At the annual meeting of the Torrey Botanical Club, on January 8, the officers of the preceding year were reelected, and an additional associate editor was added to the editorial staff. An amendment was introduced to increase the number of associate editors to eight instead of seven.

A reception to visiting botanists was given at Schermerhorn Hall on Wednesday evening, December 26, 1906, by the Torrey Botanical Club. It was largely attended and highly successful.

The Board of Managers of the New York Botanical Garden entertained at luncheon the botanists attending the session of the Botanical Society of America held in the Museum of the Garden on Saturday, December 29, 1906.

The American Association for the Advancement of Science held its fifty-seventh meeting in New York City, December 27, 1906, to January 2, 1907. As has been the custom in late years, various affiliated scientific societies held sessions in the same city during the same week. Section G (botany) met in Schemerhorn Hall, Columbia University, on Thursday afternoon, December 27, on Friday morning, and on Monday, with the vice-president, Dr. D. T. MacDougal, in the chair. Dr. Tracy E. Hazen acted as secretary in the absence of Professor F. E. Lloyd. The Friday morning session was a joint one of Sections F (zoölogy) and G, devoted to the discussion of heredity. In the absence of the retiring chairman, Dr. Erwin F. Smith, his vice-presidential address was omitted. Professor Charles E. Bessey was elected chairman of Section G for the next meeting. About 125 botanists were in attendance at the sessions of the Section and of the affiliated societies.

The Botanical Society of America met in New York City, December 27–31, 1906. The federation of the three societies, the Botanical Society of America, the American Mycological Society, and the Society for Plant Morphology and Physiology, was effected at the first session on Thursday, December 27. The president, Professor F. S. Earle, acted as chairman during the first day; as he was not able to be present at the later sessions, the chair was occupied by the vice-president, Professor Frederic E. Clements. Meetings for the readings of scientific papers were

held on Thursday, at Schermerhorn Hall, Columbia University; on Saturday, at the Museum of the New York Botanical Garden, when one of the papers was the address of the retiring president, Professor R. A. Harper, on "The Organization of certain Coenobic Plants"; and on Monday, at Schermerhorn Hall. In all, twenty-nine papers were presented. Officers of the new Botanical Society of America were elected as follows: Professor George F. Atkinson, president; Dr. N. L. Britton, vice-president; Professor D. S. Johnson, secretary; Dr. Arthur Hollick, treasurer.

The American Society of Naturalists held its twenty-fourth annual meeting in Schermerhorn Hall, Columbia University, New York City, on the afternoon of Friday, December 28, 1906. The scientific program consisted of a discussion of the biological significance and control of sex, and several of the papers viewed the topic from a botanical standpoint.

The Sullivant Moss Chapter held a meeting on Friday afternoon, December 28, 1906, in Schermerhorn Hall, Columbia University, the president, Mr. Edward B. Chamberlain, in the chair. In the absence of the secretary, Dr. John W. Bailey, Miss Edith A. Warner acted as secretary pro tem. There were exhibits by members of specimens and photographs, and a scientific program of six papers, by Professor A. W. Evans, Miss Annie Lorenz, Mrs. Elizabeth G. Britton, Professor Bruce Fink, Dr. A. J. Grout and Mr. R. S. Williams.

At the American Museum of Natural History, on the afternoon of Saturday, December 29, 1906, occurred the ceremonies attending the unveiling of the busts of American men of science, presented to the Museum by Mr. Morris K. Jesup. Among the busts unveiled was that of Professor John Torrey, and a brief memorial address upon the life and work of Dr. Torrey was delivered by Dr. N. L. Britton. Busts of Alexander von Humboldt and Joseph Leidy, both of whom contributed to the advancement of botanical science, although better known from their work in other fields, were also among the number.

Vol. 7 No. 2

TORREYA

February, 1907

JANE COLDEN, AN EARLY NEW YORK BOTANIST

By Anna Murray Vail

A few years ago Mr. James Britten published in the *Journal of Botany* (33: 12. 1895) a sketch of the life of Miss Jane Colden, with a description of her MS. Flora of New York, which is preserved in the Department of Botany of the British Museum. This sketch was compiled from the numerous, but all too fragmentary, references to Miss Colden that are scattered through her father's correspondence and elsewhere in biographies of the period, and is most entertaining reading.

It is with the object of adding a few more facts to those collected by Mr. Britten, as well as to make known something about the first botanist of her sex in the state, that these notes are offered to the Club.

Jane, the second daughter of Lieutenant-Governor Cadwallader Colden, was born in New York, March 27th, 1724. Her father was the son of the Rev. Alexander Colden, minister of Dunse, in the Merse Berwickshire, Scotland. He received his education at the University of Edinburgh, with a view to entering the Church of Scotland, but, his tastes turning in other directions, he devoted himself to the study of medicine. Owing to limited means, his father was unable to assist him in starting a career at home, so he came to this country in 1710 to try his fortune in America, as he himself puts it in a letter to Kalm. Here he settled in Philadelphia, residing with a widowed sister of his mother's, who had established herself there, and began the practice of his profession. That his affairs did not prosper to his satisfaction or that he had a taste for adventure is evinced by the fact that we hear of him as trading in the colonies and in the West Indies.

[No. 1, Vol. 7, of Torreya, comprising pages 1–20, was issued February 7, 1907.]

In 1715 he returned to England and "in pursuance of the main object, probably, of his visit to his native land," he went to Scotland, where, in November of the same year, he married Alice Christy. The following year saw them both in Philadelphia, and in 1718, accepting the offer from Governor Hunter of a position as master in chancery and surveyor-general, Dr. Colden fixed his residence in New York.

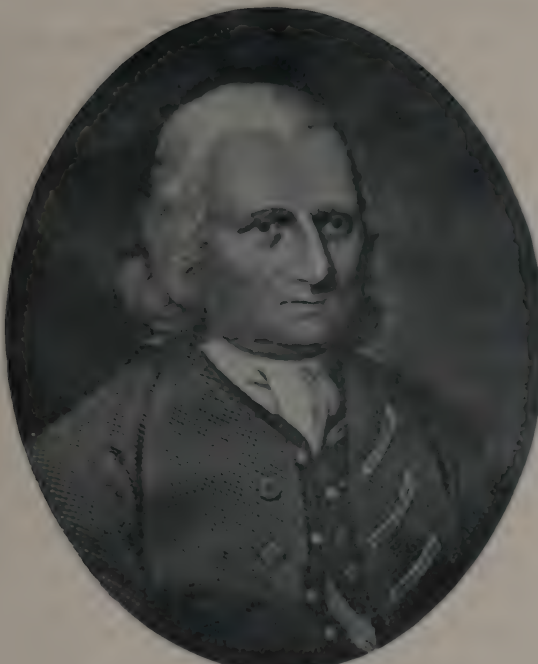
In 1719 a patent for 2,000 acres of land situated in Ulster County was issued to him, and shortly after he procured another thousand acres adjoining the first, and to this manor he gave the name of "Coldengham," still known to-day as Coldenham, in the town of Montgomery, Orange County.*

The details of his active life are too well known to be recounted here. Suffice it to say that about this time Governor Hunter offered him a small stipend for the compilation of a list of the plants and animals of New York. This work was to be pursued on his surveys, but, owing to extensive cutting down of expenditures in the province, it was not carried out. As regards the flora of the state as a whole, this was only accomplished nearly a hundred years later with the publication in 1814 by Jacob Green of his "Catalogue of the Plants Indigenous to the State of New York," and later by the more complete and detailed works of John Torrey, published 1840–43.

In 1728 Dr. Colden with his wife and six young children removed to Coldengham, being led thereto among other reasons "to secure in the — then wilderness abode that leisure for philosophical study to which he was so much inclined."

It was during his residence there for more than thirty years that he maintained a most voluminous correspondence with a number of learned men in Europe. In the intervals of political and literary pursuits he devoted himself to the reclamation and cultivation of his estate, and, with his accomplished wife, to the education of their children. It was here that he wrote that first of "local floras" of New York, the "Plantae Coldenghamiae," eventually published by Linnaeus, with whom he had been in

* Purple, E. R. Genealogical Notes of the Colden Family in America. New York; privately printed, 1873.



Cadwallader Colden

[From the Historical Magazine, volume 9, January, 1865.]

correspondence, in the "Acta Societatis Regiae Scientiarum Upsaliensis," in 1749, and here Jane grew up and acquired that taste for natural history of which her father wrote in the oft-quoted letter to Gronovius. The portions of this letter which refer to Jane are here printed as copied from the original draft:*

"TO DR. JOHN FREDERIC GRONOVIUS
Senateur de la Ville de Leiden.

New York Oct. 1st, 1755.

* * * "I (often) thought that Botany is an amusement which may be made greater to the Ladies who are often at a loss to fill up their time (& that) it could be made agreable to them (it would prevent their employing so much of their time in trifling amusements as they do). Their natural curiosity & the pleasure they take in the beauty & variety of dress seems to fit them for it (far more than men). The chief reason that few or none of them have hitherto applied themselves to this study I believe is because all the books of any value are wrote in Latin & so filed with technical words that the obtaining the necessary previous knowledge is (attended with) so (much) tiresome and disagreable that they are discouraged at the first set out & give it over before they can receive any pleasure in the pursuit.

"I have a daughter, who has an (natural) inclination to reading & a curiosity for natural philosophy or natural History, & a sufficient capacity for attaining a competent knowledge. I took the pains to explain Linnaeus's System (for her), and to put it in English for her use by freeing it from the Technical terms, which was easily done by useing two or three words in place of one. She has now grown very fond of the study, and has made such progress in it that as I believe would please you if you saw her performance, tho' perhaps she could not have been persuaded to learn the terms at first, she now understands in some degree Linnaeus' characters, notwithstanding that she does not understand Latin. She has already a pretty large volume in writing of the Description of plants. She was shown a method of taking the impression of the leaves on paper with printers ink, by a simple kind of rolling press which is of use in distinguishing the spe-

* Colden MSS. in the New York Historical Society. For permission to examine some of these MSS. I am indebted to the librarian of the New York Historical Society.

This letter is somewhat differently printed in "Selections from the Scientific Correspondence of Cadwallader Colden with Gronovius, Linnaeus, Collinson and other Naturalists," Am. Jour. Sci. and Arts 44: 133. 1843.

cies by their leaves. No description in words alone can give so clear an idea as when the description is assisted with a picture. She has the impression of 300 plants in the manner you'l see by the sample sent you. That you may have some conception of her manner of describing (of plants) I propose to enclose some (two or three) Samples in her own writing, some of which I think are new genus's. One is of the *Panax foliis ternis ternatis* in the Flora Virg. . . . I never had seen the fruit of it till she discover'd it. The fruit is ripe in the beginning of June and the plant dies immediately after the fruit is ripe & no longer to be seen. Two more I have not found described any where and in the others you will find some things particular which I think are not taken notice of by any Author I have seen. If you think S^r that She can be of any use to you She will be extremely pleased in being employed by you either in sending Descriptions for any Seeds you shall desire or dried specimens of any particular plants that you shall mention to me. She has time to apply herself to gratify your curiosity more than I ever had and now when I have time the infirmities of age disable me."

Mr. Britten describes the "pretty large volume in writing" as follows:

"The 'pretty large volume in writing' is now in the Department of Botany in the British Museum. After the writer's death it passed into the hands of F. von Wangenheim, then into those of Godfrey Baldinger, and finally became the property of Banks. An account of the MS. is prefixed by Wangenheim, and a title-page was added by Baldinger, of which the following is a transcript:

FLORA
NOV.-EBORACENSIS.

Plantas in Solo Natali
collegit, descripsit,
delineavit,
COLDENIA,
CADWALLADER COLDENS
Filia.

Divitiis Bibliothecae
Josephi Banks
adiecit

Ern. Godofr. Baldinger,
olim in Aca. Jememsi Prof. Bot.
et Med. Theoret. ; in Acad. Goettingensi
Med. Pract. ; in Academia Marburgensi
Ord. Medicor. Prof. Primarius.

Anno 1801

"The prefatory note by Wangenheim is published in the account of the MS. given in Schrader's *Journal für die Botanik* for 1800 (Göttingen, 1801) p. 468. The following is a translation :

'This MS., which has never been printed, contains a part of the New York Flora, and has been composed by a lady, the daughter of Governor Cadwallader Colden, well known for his botanical works, and also a physician. This lady married a doctor of medicine, Farquer (Farquhar), a Scotchman by birth, and she died soon afterwards. Some of the names are according to her father and according to Gronovius, and some are according to the Brandenburg doctor Schoepff, who has read this work. The trivial names are according to Linnaeus.

'This work is a remarkable one because it is that of a lady who possessed such a love for botany that she learned Latin, and judging by its nature is so worthy and correct that it contains many even minute things.

'This is written by F. von Wangenheim,
Captain in the Field-Jäger Corps of the Landgrave of Hesse
New York, May, 1782.'

"It will be observed that this narrative contradicts Gray's statement that Jane Colden died unmarried : Pritzel accepts Schrader's account but adds, 'Moriens (1754) Floram manuscriptam Novi Eboraci tabulis ornatam reliquit Wangenheimio.' If the MS. was bequeathed to Wangenheim, it is strange that he did not say so : the date given for her death is certainly inaccurate. Wangenheim's statement that she 'learned Latin' is contrary to her father's account, but probably only means that she acquired the Latin names of the plants she described ; the descriptions in the MS. (to which she gave no title) are all in English.

"The actual number of figures is 340 : the numbers of the descriptions run to 341, but these are really less numerous, as a good many pages are blank, save for the name of the plant at their head. This suggests that the figures were made before the

descriptions, they are very poor and consist only of leaves.* The descriptions, on the other hand, are excellent — full, careful, and evidently taken from the living specimens. One of these has been published in full (No. 153 of the MS.) in *Essays and Observations*, vol. ii (Edinburgh, 1770). The plant (*Hypericum virginicum*) to which it refers had been sent her by Alexander Garden, who found it at New York in 1754; in return, Miss Colden sent him the description of the same plant, which she had discovered during the previous summer, and, 'using the privilege of a first discoverer, she was pleased to call this new plant *Gardenia*, in compliment to Dr. Garden.' Another of her descriptions, translated into Latin, was sent by Ellis to Linnaeus in 1758, and is published in the *Correspondence of Linnaeus* i. 94. The plant to which it referred was retained by Linnaeus in *Helleborus*, but separated by Salisbury (who has been followed by subsequent botanists) under the name of *Coptis*. Miss Colden (No. 292) called it *Fibraurea*, a translation of the popular name 'Gold Thread.' Ellis, forwarding the description, says: 'This young lady merits your esteem, and does honour to your System. She has drawn and described 400 plants in your method only: she uses English terms. Her father has a plant called after him *Coldenia*, suppose you should call this *Coldenella*, or any other name that might distinguish her among your Genera.' Unfortunately, Linnaeus did not recognize the genus as distinct, so neither of these names was adopted."

"Little indications in the descriptions show that Miss Colden went among the country folk and noted their names and rustic remedies. Thus of *Pedicularis tuberosa* (No. 41) she says: 'The Pedicularis is called by the country people Betony: They make Thee of the Leaves, and use it for the Fever and Ague.' *Asclepias tuberosa* is 'an excellent cure for the Colick. This was learn'd from a Canada Indian, and is called in New England Canada Root. The Excellency of this Root for the Colick is confirm'd by Dr. Pater of New England, and Dr. Brooks of

* The figures are merely ink outlines washed in with neutral tint, not the 'nature printed' ones mentioned in Colden's letter, of which, however, there is one example at the end of the book.

Maryland likewise confirmed this.' The root of *Solidago canadensis* 'is used in Carolina for the cure of the Negro Poison'; *Oenothera biennis* is 'call'd here by the Country People, Seabedge'; *Malva caroliniana* is 'called in South Carolina, Bohea Tea:' and *Gillenia trifoliata* is 'call'd here, Ipecacuanha.' Occasionally a note shows particular observations, such as this on *Clematis virginiana*: 'Neither Linnaeus take notice (*sic*) that there are some Plants of the Clematis that bear only Male flowers, but this I have observed with such care, that there can be no doubt of it.'"

Numerous references to her in Darlington's * Memorials of John Bartram and Humphry Marshall, Smith's † Correspondence of Linnaeus and elsewhere in contemporaneous records and biographies, evince the fact that she had become well known to her father's friends and that her botanical accomplishments were appreciated and her services in the matter of the collection of seeds and plants often taken advantage of.

Peter Kalm on the 29th September, 1748, sends his respects to Mistress Colden, the Misses and young Master Colden.

In a letter from John Bartram ‡ to Peter Collinson dated 1753, he describes a journey to the "Katskill Mountains" with his son "Billy" and writes of a visit to Coldengham in the following words:

"At night, we lodged seven or eight of us (they being two families) in the hut, hardly big enough for a hen-roost — I and Billy on the ground — after a piece of a musty supper. Slept but little in this lousy hut, which we left, as soon as we could well see our path, in the morning, having paid him half a crown, which he charged, and reached Dr. Colden's by noon. Got our dinner, and set out to gather seeds, and did not get back till two hours within night; then looked over some of the Doctor's daughter's botanical, curious observations. Next morning, as soon as I could see, we hunted plants till breakfast: then the Doctor's son went with me to Doctor Jones's, where we observed the Pines, on a high hill near the Doctor's. After dinner, we went to the river to gather *Arbor Vitae* seeds: then returned to Dr. Colden's by two hours within night. In the morning gathered seeds till break-

* Darlington, W. Memorials of John Bartram and Humphry Marshall. Philadelphia. 1849.

† Smith, T. E. Selection of the Correspondence of Linnaeus. London. 1821.

‡ Darlington. Memorials, 195.

fast. These two days I could have refreshed myself finely, if the Doctor had been at home, or durst have eaten freely of what was set before me; for they all were very kind."

Further on in a letter from Peter Collinson to John Bartram dated January, 1756, he expresses himself in regard to Miss Colden's accomplishments in the following terms:

"Our friend Colden's* daughter has, in a scientific manner sent over several sheets of plants, very curiously anatomized after his† method. I believe she is the first lady that has attempted anything of this nature. They are to be sent to Dr. Gronovius; and he, poor man! I believe is in a bad state of health; for I cannot get a line from him (who used to be very punctual), if he has received Billy's fine drawings of Oaks, and thy system. Though I have writ several letters, I shall this day send another."

But the most interesting of all is the letter from John Bartram to Miss Jane Colden dated January 24th, 1757, that begins:

JOHN BARTRAM TO MISS JANE COLDEN.‡

"January the 24th, 1757.

"RESPECTED FRIEND JANE COLDEN:

"I received thine of October 26th, 1756, and read it several times with agreeable satisfaction: indeed, I am very careful of it, and it keeps company with the choicest correspondence, — European letters.

"The Viney plant thee so well describes, I take to be the *Dioscorea* of Hill and Gronovius; though I never searched the characters of the flower so curiously as I find thee hath done; but pray search them books, thee may presently find that article.

"I shall be extremely glad to see thee once at my house, and to show thee my garden. My Billy is gone from me to learn to be a merchant, in Philadelphia, and I hope a choice good place, too (Captain Childs). I showed him thy letter, and he was so well pleased with it, that he presently made a packet of very fine drawings for thee, far beyond Catesby's, took them to town, and told me he would send them very soon. I was then in a poor state of health: but am now well recovered. We very gratefully receive thy kind remembrance, and my two dear friends, thy father and mother. I want once more to climb the Katskills; but I think it is not safe to venture these troublesome times.

"I have had several kinds of the *Cochleata*, or Snail Trefoil, and *Trigonella*, or Fenugreek; but, being annual plants, they are gone off. The species of Persicary thee mentions, is what Tournefort brought from the three churches, at the foot of Mount Ararat.

"The *Amorpha* is a beautiful flower; but whether won't your cold winters kill it?

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* Darlington. Memorials, 202.

† Linnaeus.

‡ Darlington. Memorials, 400.

"If the Rhubarb from London be the Siberian, I have it. I had the Perennial Flax, from Livonia. It growed four feet high, and I don't know but fifty stalks to the root ; but the flax was very rotten and coarse. The flowers are large and blue. It lived many years and then died.

JOHN BARTRAM.

In a letter written to Dr. Colden,* Dr. Alexander Garden of Charleston, S. C., writes in 1754 "I shall be glad to hear of Miss Colden's improvements, which no doubt increase every day, and may we again be surprised with more than a *Dacier*, even in America."

Dr. Garden's letters, both published and unpublished, contain many allusions to Jane and there were evidently frequent communications that passed between them. In 1755 in a letter to Mr. Ellis † he writes of Dr. Colden as a great botanist and adds with true eighteenth century gallantry that "his lovely daughter is greatly master of the Linnean method." This last statement in regard to her personal appearance, if she at all resembled her distinguished, but homely father, being more due to the adulatory style of the day than to actual fact, and that Jane's good sense resented an excess of flattery is shown in some later letters.

In an undated and unlabeled fragment addressed presumably to Dr. Colden ‡ he writes :

"I have sent you some of the Amorpha a very Curious plant & peculiar to Carolina — in Linnaeus Species Plantar. there is only one Species known but I have (another) which I have brought down from Saluda with me — Miss Colden will be much pleased with it. It flowers with us in Aprile, May & June, & its flowers make a beautiful apearance in a spike. When you favor me with a line please direct to Dr. Alex[d]. Garden, Physician in Charlestown, So. Carolina."

Again in a letter dated Charlestown Febry 18, 1755, he writes :

"I sent you some more of the true Indigo seed and some Millet Seed which I am persuaded will both grow very well to you. I mentioned to Miss Colden that the Small Bags of Shells something like Hops that she has are the real Matrices of the Buccinum ampullatum of Dr. Lister — Give me leave to present my Compliments to Miss Colden and your kind family."

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* Gray. Selections.

† Smith. Correspondence of Linnaeus, 348.

‡ Colden MSS.

On May 20th, 1755, he writes:

"It gives me great pleasure that you give me leave to send Miss Colden's Description of that new plant to any of my Correspondents as I had before sent it to Dr. Whytt at Edinburgh — By your second letter I find I have very innocently offended Both you and Miss Colden by some of the expressions that insensibly dropt from my pen as archetypes of what my heart dictated in warm sincerety. This gives me real concern and give me leave to assure you I shall endeavour as far as in my power to amend anything in my conduct or manner of writing that you are kind enough to point out as wrong. I trust that Both you and your Daughter will forgive me for once. I shall be more sparing in saying what y. think is due to such merit in the future. The Expression which you say gave her most offence, gives me now a great deal of uneasiness as I suspect it has deprived me of the pleasure of a letter from her by last opportunity — It is now past the season of Seeds but I'll endeavour to procure Such as Miss Colden may want this year, tho' my present Business confines me much to Town. — Please offer my compliments to Miss Colden & Family."

Another letter and one of the last containing references to Miss Colden is the following:

Charlestown, November 27, 1755.

"Sir — Your most obliging fav' of Octo[br] last now lyes before me, which came very safe to hand by Schermerhorn as Did the Papers of seeds which your daughter was kind enough to honour me so by his formal trip. I readily confess my neglect in not writing her in return sooner but an affair of Love quite engrossed my thoughts for a season* — [and he ends a long somewhat fantastic letter with —] offer of a kindest compliment to Miss Colden," etc.

Miss Colden's accomplishments were not all, however, of a botanical nature. Her mother, Mrs. Colden, the daughter of a Scotch minister, is said to have been a distinguished woman and fully able to fill the social position and to discharge the many duties that fell to her lot. In addition to the numerous cares that were imposed on the housewife of the period, Mrs. Colden assisted her husband in the administration of his estate and in the copying of his correspondence, and owing to his political duties and consequent lengthy and frequent absence from home, much of the education of their children must have devolved on her. She is said to have taught them habits of "virtue and

* The "affair of love" is doubtless an allusion to his approaching marriage, which occurred in Charleston on Christmas Eve, 1755.

economy" and gave them in her life and character the "brightest of examples," so it can be presumed that her daughters were apt scholars in the accomplishments required of well-bred and trained gentlewomen of the day.

The following reference to Miss Colden was the means of identifying with a fair amount of certainty some unsigned household records of hers that are preserved among her father's scientific papers. *

Walter Rutherfurd was an ancestor of the well-known New York family of that name. He came to America in 1756, while the French war was in progress, and served as an officer of the Royal Americans. In New York in 1758 he married Catharine, the widow of Elisha Parker and a daughter of James Alexander. About this time he wrote to a friend in Scotland, describing a visit to Albany: †

"At one of our landings we made an excursion to Coldenham, the abode of the venerable Philosopher Colden, as gay and facetious in his conversation as serious and solid in his writings. From the middle of the Woods this family corresponds with all the learned Societies in Europe. Himself on the principles of Matter and Motion, his son on Electricity and Experiments. He has made several useful discoveries and is a tolerable proficient in music. His daughter Jennie is a Florist and Botanist, she has discovered a great number of Plants never before described and has given their Properties and Virtues, many of which are found useful in Medicine, and she draws and colors them with great beauty. Dr. Whyte, of Edinburg, is in the number of her correspondents. N. B. She makes the best cheese I ever ate in America."

With this note in mind it does not seem unreasonable to suppose that the "Memorandum of Cheese made in 1756" is in Jane's writing. This "Memorandum" consists of five sheets of foolscap and is the careful and painstaking record of her year of cheesemaking. The following are the two first receipts:

* Colden MSS.

† Family Records and Events, Compiled chiefly from the original MSS. in the Rutherfurd Collection. By Livingston Rutherfurd. Privately printed; 1894. (Only 150 copies.)

MEMORANDUM OF CHEESE MADE IN 1756.

May

25 No 1. To this I had a large Pan of Milk more than the Cheese tray would hold. I had used Rennet that was left since last summer, it was very long of thickening & I was obliged to put a great deal in. I made it according to a receipt I got from Sister Willett.* In scalding the Curd after it was chopped there was a good deal of yellow oyl raised on top of the Whey, as it was on the Curd & and when I drained it the second time it had lost much in Bulk. I can not approve of this method, it lost a good deal of rich whey. I expect it will be strong of the Rennet and not be good.

(It was good except a little too much taste of the Rennet)

27 2. To this I had the same quantity of milk as to the former, I put one Spoonfilles of the Rennet in it, it thickened in a very short time. I made it after my Mother's old manner, it was a tender good curd and lost very little rich Whey. When it came out of the press it weighed 25 pounds. The first weighed 20 pounds, the third day after it came out of the press.

Later, in the following November she weighed her cheeses and notes their reduced bulk, and there are also notes as to how they eventually tasted. At the end of the sheets she made a list of her milkings and the sales of her butter, showing that in the year she sold 348 pounds of butter that netted her £12.13.3. She even did not omit the names of the purchasers of her butter, nor the amounts sold each time.

It is impossible not to conjecture as to whether any of these cheeses were those extolled by Walter Rutherfurd! And it is much to be regretted that the drawings "coloured with great beauty" have all disappeared. They surely cannot have been the figures done in "ink outlines washed in with neutral ink" of the "pretty large volume" so graphically described by Mr. Britten.

Jane Colden † married Dr. William Farquhar, a Scotchman and a widower; their marriage license was dated March 12th, 1759. She died March 10th, 1766; her only child in the same year

* Alice, third daughter of Governor Colden, born September 27, 1725, married Colonel William Willett, she being his second wife. She died in 1762.

† Purple, Colden Family in America, 20.

and her husband in 1787. He is described as "a very worthy good Scotsman" and for some years before the Revolutionary War one of the chief and fashionable practitioners of medicine, "distinguished for his abilities and knowledge" in New York City and vicinity. He was one of the founders of the St. Andrew's Society of the State of New York, formed in 1756 of Scotchmen by birth or descent for social and charitable purposes. He acted as an "assistant" (manager) of the Society in 1756 and as vice-president in 1757.*

After 1759 Jane's name does not appear to be mentioned in her father's correspondence, nor can any reference to her marriage be found there. Her place of burial is unknown.

Governor Colden died on Long Island, September 20, 1776, aged over eighty-eight years, and was buried in the private burying-ground on the Willett farm, "Spring Hill," that he purchased in 1762 and where he spent the last years of his life. This property had been deeded by the governor before his death to his son David, but owing to the latter's loyalty to the Crown it was confiscated in 1779 and passed into other hands. At the present time, Governor Colden's farm lies within the limits of Cedar Grove Cemetery in the Borough of Queens, and the ancient burying-place is still extant. Though fallen into decay, it has not been disturbed and is to be preserved in its present condition. Numerous rough stones, bearing the names of members of the Willett family are dated from 1722 to 1797, and local authorities relate that there is a stone with a Colden name on it there, but owing to the heavy snowdrifts at the time of writing, this could not be verified, and does not agree with descriptions of the spot made in 1873.† Governor Colden's fine old mansion is now the office of the cemetery, and is said to have been but little altered in recent years.

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* For some of these details, I am indebted to Mr. George Austin Morrison Jr., Secretary of the Saint Andrew's Society.

† Purple, Genealogical Notes, 9.

NEW NORTH AMERICAN CRATAEGI

By W. W. Eggleston

Crataegus Oakesiana sp. nov.

Sometimes a small tree 5 meters high but more often a beautiful round-topped shrub with the habit of *C. rotundifolia* (Ehrh.) Borckh.; the bark grayish-brown and scaly; the young twigs slightly pubescent at first, becoming smooth, chestnut-brown, and frequently armed with bright chestnut-brown, stout, curved spines from 2 to 4 cm. long: leaves ovate, 3–7 cm. long, 2–6 cm. wide, doubly serrate for the upper two thirds, finely serrate towards the base, acute or acuminate at apex, cuneate at base, often abruptly so, green and shining above, paler beneath, slightly pubescent on the upper surface when young, soon becoming smooth; petioles wing-margined above, remotely glandular-serrate, 1–2 cm. long: flowers about 2 cm. wide in many-flowered, slightly villous, compound corymbs; calyx-tube villous, the lanceolate, acuminate, glandular-serrate sepals smooth on the outside, slightly pubescent on the inside; stamens about twenty; anthers light-yellow; styles 3–5: fruit ripening the first week in September, pyriform to oblong, slightly angular, yellowish-red, about 1 cm. thick, with deciduous sepals; the flesh soft, mealy, light-yellow, containing 3–5 nutlets, 6–7 mm. long, strongly ridged on back, the nest of nutlets 7–8 mm. thick.

This species occurs frequently along the roadsides and in open thickets by the Connecticut River in Essex County, Vermont, at an altitude of about 300 meters. Specimens seen: *no. 1146*, Aug. 5, 1899; *no. 3410*, May 31, 1903; *no. 3411*, Sept. 15, 1903; and *no. 1146*, Sept. 9, 1904—all at Bloomfield, *Eggleston*. *No. 2265*, May 26, 29, 1901; *no. 1859*, Oct. 3, 1901—both at Canaan, *A. B. Frizzell*. Type *no. 1146*, *Eggleston*, in the Herbarium of the New York Botanical Garden.

Crataegus Oakesiana belongs to the group Rotundifoliae, differing from *C. rotundifolia* in larger flowers, thinner differently shaped leaves, and pear-shaped yellowish fruit, with more nutlets.

Crataegus Baroussana sp. nov.

A bush sometimes 5–6 m. high, with smooth, reddish-brown twigs armed with slender, curved spines 2–3 cm. long: leaves ovate-elliptical to obovate, coarsely and doubly serrate on the

upper two thirds, often slightly cut towards the apex, finely serrate or entire towards the base, acute or acuminate at the apex, broadly cuneate at the base, 3–7 cm. long, 3–4.5 cm. wide, subcoriaceous, dark-green and shining above, paler below, young leaves slightly appressed-pubescent above, becoming scabrous, smooth beneath; petioles slightly winged above, a little pubescent, about 1 cm. long: flowers white, about 15 mm. wide, in few-flowered, slightly villous, compound corymbs; pedicels subtended by deciduous pinkish bracts about 10 mm. long, 2 mm. wide, the edges serrated with stalked glands; calyx-tube smooth or sometimes slightly pubescent; sepals linear-lanceolate, acuminate, sharply glandular-serrate, about 7 mm. long, smooth on the outside, appressed-pubescent above; stamens about 10; anthers light salmon-pink; styles 4–5, smooth at base: fruit oblong to pyriform, red, slightly pubescent, about 2 cm. long; flesh thick, soft when mature, ripe about the first of October; calyx-lobes reflexed, generally deciduous; fruit containing generally five nutlets 7–8 mm. long, strongly ridged on the back, nest of nutlets about 8 mm. thick.

This species was found by Dr. C. G. Pringle on the estate of Mr. Eugene Barousse in the mountains southeast of Saltillo, Coahuila, Mexico; he states that it is reported from other mountains in the State of Coahuila, and that the fruit is used in a marmalade in a number of towns of the state. Type, *no. 10083, Pringle,* Oct. 4, 1905 (flowers, April 12, 1906), in herbarium of the New York Botanical Garden.

This species is entirely different from any described from either Mexico or South America; it seems to have its nearest relatives among some of the Texas species, being nearest to *C. Berlandieri* Sargent, except in the character of the leaves, in which it has some affinities with the group Douglasianae of the western United States.

New York Botanical Garden.

SHORTER NOTES

New Stations for two Plants. — *Kyllinga pumila.* — Professor R. E. Schuh, of California, Pa., recently sent me some plants which he identified as *Kyllinga pumila* Michx. On comparison with material in the Carnegie Museum the identification

proves correct. The plants were collected along a ditch near California, Washington County, Pa. It has not been formerly reported from this state, and possibly this marks the northeastern limit of this plant.

The range for this plant is given in Gray's Manual, Ohio to Illinois, south to Florida and Texas; in Britton and Brown's Illustrated Flora, Virginia to Florida, west to Illinois, Missouri, Texas and Mexico; in Small's Flora of the Southeastern U. S., Virginia to Illinois, Missouri, Florida, Texas and Mexico.

Cycloporus Greenei. Mr. and Mrs. O. E. Jennings, of the Carnegie Museum, collected some fungi at Ohiopyle, Pa., during the month of September, 1906, and in the collection was an excellent specimen of *Cycloporus Greenei* (Berk.) Murrill. Only one plant was found. This is the first report of its occurrence in Pennsylvania. Dr. Murrill reports it from the following states: Massachusetts, New York, Connecticut, New Jersey, Iowa, West Virginia, Vermont. (Bull. Torrey Club **31**: 423. 1904.)

D. R. Sumstine.

Wilkinsburg, Pa.,
January 2, 1907.

Note upon a Guam Species of Ipomoea. — In Safford's "Useful Plants of Guam," Contr. U. S. Nat. Herb., volume 9, Mr. W. F. Wight proposes a new name, *Ipomoea Choisiana* for *I. denticulata* (Desr.) Choisy (1833), not R. Br. (1810). It would seem strange if one who has written as much regarding the Convolvulaceae as has Choisy, should not already have had some species in the group named for him, and we find several, two of them in *Ipomoea*, viz:

Ipomoea Choisyi Montr. Mem. Acad. Lyon **10**: 237. 1860.
Ipomoea Choisyana Hallier f. Bot. Jahrb. **18**: 130. 1894.

The species which Mr. Wight renames has other names prior to that taken up by Choisy in *Ipomoea*. Robert Brown described it as *I. gracilis* (Prodr. 484. 1810), and as there appears to be no earlier use of that name in *Ipomoea*, it will stand for that species.

IPOMOEA GRACILIS R. Br. Prodr. 484. 1810. G. Don, Gen. Syst. **4**: 271. 1838.

Convolvulus denticulatus Desr.; Lam. Enc. Meth. **3**: 540. 1789.

C. gracilis Spreng. Syst. **1**: 604. 1825.

Ipomoea littoralis Blume, Bijdr. 713. 1825.

I. denticulata Choisy, Mem. Soc. Phys. Genev. **6**: 467. 1833. DC. Prodr. **9**: 379. 1845. Not R. Br. 1810.

I. Choisiana W. F. Wight, Contr. U. S. Nat. Herb. **9**: 298. 1905.

It is to be noticed that Choisy also admits *I. gracilis* R. Br. in the DeCandolle Prodromus (**9**: 370), without having seen any specimens. Hallier, who has made rather exhaustive studies in this group, pronounces *I. gracilis* of R. Brown identical with *I. denticulata* Choisy but retains the latter name for the species. (Bot. Jahrb. **18**: 139. 1894.)

H. D. HOUSE.

CLEMSEN COLLEGE, S. C.

A NEW POLYGALACEOUS TREE OF PORTO RICO. — **Phlebotaenia Cowellii** spec. nov. A tree about 6 meters high, with a trunk diameter of 1.5 dm., the twigs puberulent. Leaves elliptic to obovate-elliptic, coriaceous, acutish to short-acuminate at the apex, narrowed at the base, 7–11 cm. long, 3–5 cm. wide, glabrous on both sides except for a few short hairs on the upper side of the midvein near the base, the midvein impressed above, prominent beneath, the numerous and nearly straight lateral veins reticulate-anastomosing, more prominent above than beneath, the puberulent petiole 1 cm. long or less: racemes and pedicels tomentulose; racemes nearly or quite sessile on leafless branches, 4–10-flowered; pedicels slender, joined at the base, 6–10 mm. long; larger sepals concave, slightly unequal, about 3 mm. long, ciliolate; corolla purple, 1.5 cm. long; wings oblong-obovate, obtuse, short-clawed; keel 3-lobed, hooded, clawed, the lobes rounded, the middle lobe longer than the basal ones; petals spatulate, unequal; stamen-tube longer than the slender filaments; style slender, curved: fruit not seen.

I have alluded to this tree (Jour. N. Y. Bot. Gard. **7**: 136) as a most elegant floral feature; we had the good fortune to see it in full bloom on a steep rocky bank near Coamo Springs, Porto Rico, March 23, 1906, and good specimens of the flowers and foliage were secured (*Britton & Cowell 1331*).

The discovery of this tree adds a second species to the supposed monotypic genus *Phlebotaenia* Griseb., the type species, *P. cuneata* Griseb., being Cuban and not known to become more than a low shrub. Professor Chodat has reduced Grisebach's genus to a section of *Polygala*, but although the floral characters of *Phlebotaenia* are only slightly different from those of some Polygalas, I am quite unable to agree with him that this shrub and tree are congeneric with herbaceous Polygalas.

Professor Urban had the foliage of the Porto Rican species, collected by Sintenis near Utuado in 1887, but while correctly referring the plant in the distributed collection of Sintenis as probably Polygalaceous, he was unable to describe it, and it is not included in his flora of Porto Rico.

N. L. Britton.

Some new Plants for southern New Jersey.—The flora of southern New Jersey seems to be far from exhausted in spite of the many botanists who have devoted their attention to it. During the past few years members of the Philadelphia Botanical Club and others have found several species that are not quoted in Britton's Manual or in the Illustrated Flora as ranging north of Virginia or Delaware.

It seems desirable to call special attention to these additions to the flora of the state, although two or three of them are already recorded in Kellar and Brown's Flora of Philadelphia.

Paspalum glabratum. Found by the writer at Cape May in September, 1891, and by others at several points in Cape May County.

Brachiaria digitarioides. Collected at Piermont, September 1, 1902, by the writer, and at about the same time at Holly Beach by S. S. Van Pelt. Found abundantly near Cold Spring, Cape May County, September, 1906.

Saccolepis gibba. Discovered by C. S. Williamson at Cape May Point, September, 1905, and observed at the same place a year later by Van Pelt and Stone.

Chaetochloa magna. Collected near Cape May, September, 1891, by W. Stone.

Aristida lanosa. Collected near Medford, N. J., September 15, 1901, by W. Stone.

Sporobolus asper. Found in considerable abundance near the Bay shore above Cape May Point, by W. Stone, September 15, 1906.

Cyperus pseudovegetus. Collected near Swedesboro by Charles D. Lippincott, September 16, 1894.

Eleocharis ochreata. Discovered by S. S. Van Pelt at Cape May Point, September, 1905, and again observed the present year.

Rynchospora oligantha. Found near Speedwell, Burlington County, by S. S. Van Pelt, in July, 1906.

Specimens of all the above are in my own herbarium or in that of the Philadelphia Botanical Club.

WITMER STONE.

ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

PROCEEDINGS OF THE CLUB

DECEMBER 11, 1906

The meeting was called to order at 8:15 P. M., at the American Museum of Natural History, with President Rusby in the chair. Eight persons were present.

The reading and approval of the minutes for November 28 were followed by the nomination of Mr. Richard Schneider, of the New York Botanical Garden, for membership.

A communication, dated December 7, 1906, from the New York Academy of Sciences was read, formally inviting the Torrey Botanical Club "to send a delegate to the regular meeting of the Council on January 7, 1907," and enclosing "the amendments of the Constitution of the New York Academy of Sciences, which concern this matter and which have been drawn up according to the terms of agreement."

The amendments are as follows:

Article IV. First sentence to read: "The officers of the Academy shall be a President, as many Vice-Presidents as there

are Sections of the Academy, a Corresponding Secretary, a Recording Secretary, a Treasurer, a Librarian, an Editor, six *elected* Councillors, *and one additional Councillor for each allied society or association.*"

Article VI. A new article to be inserted as "Article VI," to read as follows:

"Societies organized for the study of any branch of science may become allied with the New York Academy of Sciences by consent of the Council. Members of allied societies may become active members of the Academy by paying the Academy's annual fee, but as members of an allied society they shall be associate members of the Academy with the rights and privileges of other associate members except the receipt of its publications. Each allied society shall have the right to delegate one of its members who is also an active member of the Academy, to the Council of the Academy, and such delegate shall have all the rights and privileges of other Councillors."

On motion it was voted unanimously that the President of the Club act as such delegate. The proposed amendment to Article XIV of the Constitution of the Club, which was laid on the table at the last meeting, came up for consideration. After discussion, a motion to adopt the amendment was unanimously carried.

The amendment reads as follows:

"Each active member, upon his election, and annually at the beginning of each fiscal year thereafter, shall pay to the treasurer the sum of five dollars. The payment of the annual dues shall entitle each active member to receive all publications of the Club issued during the year."

Letters of resignation were read from Mrs. Ida Clendenin Atchison, and from Miss Marianna Shutes.

On motion the secretary cast the vote of the Club electing Mr. Schneider to membership.

The scientific program was as follows:

"Some Hawthorns of the Vicinity of New York City," by Mr. W. W. Eggleston. Species and variations of *Crataegus* growing within the vicinity of New York City were described and illustrated by herbarium specimens.

"Centers of Distribution of Coastal Plain Plants," by Roland M. Harper.

One of the most familiar phenomena of plant distribution is that neighboring areas of equal extent often differ considerably in the number of species they contain. And it usually happens that a region with a rich flora (if a large enough area be taken into consideration) contains a considerable number of endemic species, also that many species which are not endemic grow more abundantly or vigorously in such places than in other parts of their ranges.

A well-known example of a center of distribution is the southern Appalachian region, which has the greatest variety of trees to be found anywhere in temperate eastern North America, most of which grow larger there than anywhere else ; and many species are now confined to that region, though some of them were doubtless more widely distributed in prehistoric times. Isolated islands and mountain peaks in all parts of the world are also noted for their endemic species.

Our Atlantic coastal plain (shown on map which was exhibited), though in some respects a unit, contains several pretty well defined centers of distribution. Beginning at the northern end, the first center to be considered is the so-called "pine-barrens" of New Jersey. From the available literature it would seem that the following species are either confined to that region or else are much commoner in New Jersey than in adjoining states :

Schizaea pusilla, *Sporobolus compressus*, *Dichromena colorata*, *Rynchospora pallida*, *R. Knieskernii*, *R. Torreyana*, *Xyris fimbriata*, *X. flexuosa* (*torta* of most authors), *Eriocaulon Parkeri*, *Juncus caesariensis*, *Abama americana*, *Helonias bullata*, *Xerophyllum asphodeloides*, *Oceanoros leimanthoides*, *Tofieldia racemosa*, *Uvularia sessilifolia nitida*, *Aletris aurea*, *Lophiola aurea*, *Gyrotheca tinctoria*, *Pogonia divaricata*, *Arenaria caroliniana*, *Drosera filiformis*, *Corema Conradii*, *Ilex glabra*, *Hypericum adpressum*, *Rhexia aristosa*, *Dendrium buxifolium*, *Pyxidanthera barbulata*, *Gentiana Porphyrio*, *Sclerolepis uniflora*, *Chrysopsis falcata*, *Coreopsis rosea.*

Most of these are monocotyledons, and there are more species of Melanthaceae in the list than of any other one family.

The next well-marked coastal plain center seems to be in the southern corner of North Carolina. The following species are rarely, if ever, seen more than 100 miles from Wilmington:

Tofieldia glabra, Hypoxis micrantha, Dionaea muscipula, Kalmia cuneata, Coreopsis falcata, Leptopoda Curtisii.

The following species of wider distribution seem to be more abundant within about 50 miles of Wilmington than they are at a distance of 100 to 200 miles in either direction:

Selaginella acanthonota, Pinus palustris, P. serotina, Aristida stricta, Campulosus aromaticus, Dichromena latifolia, Zygadenus glaberrimus, Lilium Catesbaei, Smilax laurifolia, Habenaria blephariglottis, Nymphaea sagittifolia, Amorpha herbacea, Polygala lutea, P. ramosa, Gordonia Lasianthus, Cyrilla racemiflora, Clethra alnifolia, Vaccinium crassifolium, Sabbatia lanceolata, Carphephorus bellidifolius, Aster squarrosus, Marshallia graminifolia.

By far the greatest center of pine-barren plants, or perhaps an aggregation of two or more subcenters, is in Georgia and northern Florida. Probably $\frac{3}{4}$ if not $\frac{9}{10}$ of all pine-barren species can be found in Georgia; at least a dozen are confined to that state and many more to Georgia and Florida together. In the Altamaha Grit region (the middle third of the coastal plain) of Georgia there are nearly 150 species on sand-hills, about the same in dry pine-barrens, 200 in moist pine-barrens, and 75 in pine-barren ponds. These numbers are undoubtedly larger than for the same habitats in any other state unless it be Florida.

In subtropical Florida there are of course many plants not found farther north, but practically all of these center in the tropics and therefore outside of the region under consideration.

Going westward from Florida we find in the vicinity of Mobile and Pensacola a center comparable with that in southern North Carolina. To this belong *Myrica inodora, Sarracenia Drummondii, Drosera filiformis Tracyi, Pitcheria galactioides*, and perhaps *Carphephorus Pseudo-Liatris*. *Chamaecyparis thyoides* and *Sarracenia purpurea*, which are as common within 50 miles of Mobile Bay as they are in New England, seem to be entirely wanting at twice that distance, and do not appear again within two or three hundred miles, as far as known.

Pine-barrens extend as far west as Texas, and there ought to be some species of pine-barren plants confined to Louisiana and Texas, but too little is known of the flora of those parts as yet.

Plants of muddy swamps seem from all accounts to be most numerous in the Mississippi embayment of the coastal plain, from about the mouth of the Ohio River southward. Characteristic species of this region, most of them woody plants, are:

Taxodium distichum, *Echinodorus radicans*, *Arundinaria macrosperma*, *Hymenocallis occidentalis*, *Leitneria floridana*, *Hicoria Pecan*, *H. aquatica*, *Quercus Michauxii*, *Q. lyrata*, *Planera aquatica*, *Celtis occidentalis*, *Brunnichia cirrhosa*, *Platanus occidentalis*, *Crataegus viridis*, *C. apiifolia*, *Amorpha fruticosa*, *Ilex decidua*, *Acer saccharinum* (*dasycarpum*), *Berchemia scandens*, *Nyssa uniflora*, *Bumelia lycioides*, *Adelia acuminata*, *Trachelospermum difforme*, *Asclepias perennis*, *Gonolobus laevis*, *Vincetoxicum gonocarpos*, *Bignonia crucigera*, *Tecoma radicans*, *Conoclinium coelestinum*, *Mikania scandens*, *Eupatorium serotinum*.

Most of these are not wholly confined to the coastal plain, but they are more common there than elsewhere, and few if any of them ever ascend more than 1,000 feet above sea-level. Going eastward in the coastal plain they become perceptibly scarcer. There are fewer of them in Georgia than in Alabama, still fewer in the Carolinas, and only about half of them reach Virginia, though there is nothing in the climate to hinder them, as far as known.

In contrast to these five or six evident centers a few of the regions with poorer flora may be mentioned.

The coastal plain of Delaware, Maryland and Virginia seems to lack many of the species common to New Jersey and the southern pine-barrens, though some of them will probably be reported when those parts are better explored. South Carolina, too, seems to be a rather uninteresting state floristically, and there are perhaps no good species confined to it. The upper fourth of the coastal plain of Georgia (*i. e.*, the part outside of the pine-barrens) has quite a diversified topography and vegetation, but practically all the plants growing there range either northward to the mountains or coastward to the pine-barrens.

A part of the Cretaceous and Eocene regions of the coastal plain from western Alabama through northern Mississippi and West Tennessee to Kentucky is remarkable for the paucity of its flora. It is entirely outside of the pine-barrens, and nearly all of its species seem to be common and widely distributed. The same remarks will probably apply to the coastal plain of Arkansas.

The ultimate reason why so many species are found in some parts of the coastal plain and so few in others is still obscure, and perhaps each center will require a different explanation. But the importance of locating these centers is obvious; for any one who wishes merely to collect as many species as possible will save time by confining his operations to the vicinity of known centers, and the possibilities of discovering new species are greater there than in the poorer regions. When the species belonging to each center are more accurately listed, it may then be possible to discover their significance.

Adjournment was at ten o'clock.

C. Stuart Gager,
Secretary.

December 26, 1906

The regular afternoon meeting of December 26 was omitted, and in the evening a reception was given in Schermerhorn Hall, Columbia University, to visiting botanists in attendance upon the meeting of the American Association for the Advancement of Science.

Six hundred and thirty-one invitations were issued. Notes of regret were received from 169 and acceptances from 95. These notes are preserved in the files of the secretary. About one hundred and twenty-five persons were in attendance, including local members. Refreshments were served by Mazetti, of 103 West 49th St.

The evening passed quickly and pleasantly, and the reception was a most enjoyable affair to all present.

The committee of arrangements, appointed at the meeting of the Club on October 31, consisted of Professor L. M. Underwood (Chairman), President H. H. Rusby, Mrs. E. G. Britton, Dr. H. M. Richards, and Dr. C. Stuart Gager. The expenses were borne

by voluntary contributions from members of the Club. Details are included in the report of the committee.

C. Stuart Gager,
Secretary.

January 8, 1907

The annual meeting was called to order at 8:30 P. M., with Vice-president Burgess in the chair. Eight members were present.

In the absence of the recording secretary, Dr. Barnhart was elected secretary *pro tem.*

The minutes of the meeting of December 11, 1906, were read and approved.

Resignations of two members, Miss Rosina Rennert, of 366 West 120th St., and Mrs. Robert T. Morris, of 152 West 57th St., were presented and accepted.

The annual report of the treasurer was read and on motion was received and referred to the auditing committee.

In accordance with a recommendation accompanying the report of the treasurer, it was voted that a committee be appointed to report at a subsequent meeting upon the status of the membership of the Club. The treasurer and the editor were constituted a committee for this purpose.

The editor presented a verbal report. The *Bulletin* and Torreya have appeared as usual during the year, and the usual amounts have been expended upon them. Of the *Memoirs*, Vol. 13, and Vol. 12, No. 2, have been issued, upon such terms that the actual expense to the Club has been an inconsiderable one. The report was accepted.

There were no reports from the secretaries and none from the field committee.

Dr. Britton reported verbally for the standing committee on the local flora, urging the desirability of systematic work with a view to the publication of the results, and emphasizing the need of some competent person willing to undertake the direction of such work.

The annual election resulted as follows: president, H. H. Rusby; vice-presidents, E. S. Burgess and L. M. Underwood; corresponding secretary, J. K. Small; recording secretary, C.

S. Gager; treasurer, C. C. Curtis; editor, J. H. Barnhart; associate editors, Philip Dowell, A. W. Evans, T. E. Hazen, M. A. Howe, W. A. Murrill, H. M. Richards, A. M. Vail.

A proposed constitutional amendment was submitted by Dr. Barnhart, as follows:

"Originally, the Torrey Botanical Club had a single editor. In the revised constitution, adopted January 11, 1882, an associate editor was added to the list of officers. By an amendment adopted December 14, 1886, the constitution was altered to read 'associate editors, not to exceed five in number,' and by a further amendment (adopted January 26, 1898) the word five was changed to 'seven.' The constitution in its present form, therefore, reads: 'associate editors, not to exceed seven in number.'"

The proposition hereby submitted is, that Section III of the constitution be amended by the substitution of the word "eight" for the word "seven," so as to read, "associate editors, not to exceed eight in number."

Upon motion, the meeting then adjourned.

JOHN HENDLEY BARNHART,
Secretary pro tem.

NEWS ITEMS

The University of Michigan has come into the possession of a tract of land of about thirty acres, which, it is expected, will be developed as a botanical garden.

Members of the Torrey Botanical Club will be pleased to learn of the promotion of their fellow-member, Dr. Alexander W. Evans, to the Eaton professorship of botany in the Sheffield Scientific School of Yale University.

Miss Clara Eaton Cummings, Hunnewell professor of cryptogamic botany in Wellesley College, died in Concord, N. H., on December 28. Miss Cummings was well known to the botanical world through her systematic studies of the lichens.

We learn from *Science* that Professor William Trelease, director of the Missouri Botanical Garden, left St. Louis on January 24 for an expedition to the West Indies, which is expected to last about two months.

William Titus Horne (B.S., Nebraska, 1898), who held the fellowship in botany in Columbia University in 1903–'04, has been advanced to the headship of the department of plant pathology in the Estación Central Agronómica de Cuba — the position recently held by Dr. Melville T. Cook.

Dr. and Mrs. N. L. Britton and Dr. and Mrs. C. F. Millspaugh left New York early in February to continue the botanical exploration of the Bahamas. They plan this time to visit the outer islands of the group, including Eleuthera, Little San Salvador, Cat, Conception, Watlings and Long islands, and are expected to return to New York late in March.

An expedition from the University of Chicago, represented by Professor Otis W. Caldwell, and accompanied by Professor C. F. Baker and Mr. H. A. van Hermann, of the Estación Central Agronómica de Cuba, has been exploring the tree-cycad region in the Sierras of western Cuba. Cycads of regal proportions, 15 to 30 feet in height, with cones weighing 25 pounds, were found. Large series of specimens in many groups and numerous photographs were taken.

The twelfth annual winter meeting of the Vermont Botanical Club and the sixth of the Vermont Bird Club were held at the Fairbanks Museum, St. Johnsbury, January 18 and 19. Among the botanical papers presented were "Variations in Plants" by President Ezra Brainerd, "Further Observations on the Potato-Leaf Fungi" by Professor L. R. Jones, "About Red Clover" by Professor H. M. Seely, "Local Floras of Vermont" by Dr. John H. Barnhart, and "The Flora of the Limestone Cliffs of Pownal" by W. W. Eggleston. Miss Mabel Strong reported the finding of *Dryopteris Filix-mas* in Woodstock, the second known Vermont station for this fern. Officers of the Club for the ensuing year are: president, President Ezra Brainerd; vice-president, Dr. Cyrus G. Pringle; secretary and treasurer, Professor L. R. Jones; executive committee, Professor L. R. Jones, Dr. H. H. Swift, and Mrs. T. C. Fletcher. The next summer's field meeting will be held July 2 and 3 in Pownal, the extreme southwestern township of Vermont.

Vol. 7 No. 3

TORREYA

March, 1907

ON SOME DISTRIBUTION FACTORS IN THE SIERRA MAESTRA, CUBA

By Norman Taylor

Botanical collecting in the tropics constantly reminds one of the difficulty of forming any real idea of the factors that govern the distribution of plants.

In a survey of the mountains west of Santiago, Cuba, many plants of very curious distribution were met with. To travel for four weeks over a somewhat restricted but heterogeneous country and find only a single individual of *Amyris elemifera*, and also single specimens of *Calophyllum Calaba*, of a certain *Oncidium*, and of an unnamed *Euphorbia*, makes one wonder what are the factors that govern such sporadic occurrences. And these are not the only species that have apparently only individual representation, for here and there throughout the various habitats visited we came across trees, shrubs and even some herbaceous plants that were never seen again. This remarkable feature of tropical forests has often been noted before,* but no reasonable explanation is forthcoming.

Besides this occurrence of lone individuals, we find also what might be called "species centers." † That is, some species would be found in a very restricted area, and then either not be seen again, or else found in some distant but ecologically related habitat. Only a very few plants were observed in this state, which after all may be more a matter of coincidence or accidental dispersion than any well-defined system of distribution. The most noticeable of the species having these apparent distri-

* Warming, E. On the Vegetation of Tropical America. Bot. Gaz. 27: 2. 1899.

† Kurz, S. Report on the Vegetation of the Andaman Islands, 16. 1870.

[No. 2, Vol. 7, of Torreya, comprising pages 21–48, was issued February 28, 1907.]

bution centers is *Peperomia maculosa*. It was first seen growing under the shade of *Pinus occidentalis*, on a mountain slope that except for this *Peperomia* might be considered edaphically xerophytic. Not until our descent from the ridge of the Maestra did we find it again, when a fair representation was seen in an almost identical situation and at approximately the same altitude. Its absence on a number of such mountains that we visited, and its occurrence on these particular two, would seem to conform to no well-known law of distribution.

The method employed by the forestry expert in getting an idea of the timber value of an area is perhaps the best possible way to gather data on the tree distribution. From a study of these notes and figures,* we came to know the frequency of occurrence and characteristic habitat of the commercially more important trees. But the number of exceptions, and the lawlessness of the occurrence of the monotypic species, together with the equally inexplicable "species centers" make it dangerous to draw any conclusions. Indeed it is practically impossible to form any law that can reasonably account for the distribution of even a small number of the species in this region.

Although it is very difficult, perhaps impracticable, to get any real idea of the distribution of the species, it is quite possible to get some notion of the factors that govern the occurrence of the various plant associations. From topographic and climatic conditions that have been elsewhere more fully described,† we have in these mountains two well-defined ecological areas: the country lying on the southern slope, which is mostly dry, and the country on the northern slope and ridge. The latter is the windward side of the range and the strong Northeast Trade deposits most of its moisture here, leaving very little for the leeward and drier southern exposure. This has, of course, an obvious effect on the vegetation, and by this is meant not so much the diversity in the species, although this is great, as the marked difference existing in the general vegetative or floristic character of these contrasted situations.

* Fernow, B. E. The High Maestra. Forestry Quarterly 4: 250. 1906.

† Fernow, B. E. *Loc. cit.* 239; Taylor, N. Collecting in the Mountains west of Santiago, Cuba. Jour. N. Y. Bot. Garden 7: 256. N 1906.

Taking first the region within the lee of the Maestra, we have two main factors that must be taken into account in any attempt to understand the regional distribution of the plant groups; and these are the practical stability of the temperature and rainfall, and the great instability and inequality of available surface- or drainage-water. With these in mind we may enumerate several variations in the plant associations that are directly traceable to one or both of these factors. Other factors, such as soil, which throughout the region is a decomposition of the native granite, and light, which does not vary enough to make much difference, may for the time be ignored. There seems little doubt that both of these agencies are equally potent in all situations, and are not therefore violent causes of variation. On this southern exposure the three following characteristic areas may be enumerated:

Slopes and Ridges

These are covered with a dense growth of trees. The actual number of species is not very great but the number of individuals is enormous. In the expedition some hundred and fifty species were noted, and, allowing for others that were overlooked, this vast tract is covered almost exclusively with this arboreal vegetation. The number of individuals of the lower shrubs and herbaceous plants is not accurately determinable, but it is very small, so small that it can be almost truly said that these slopes and ridges are without undergrowth. An appended list of the collections from one such slope will give some idea of these conditions:

Lisabrochia denticulata	*Pithecolobium arboreum*
Oplismenus hirtellus	*Lysiloma Sabicu*
Arthrostylidium capillifolium	*Lonchocarpus sericeus*
Pharus latifolius	*Bursera Simaruba*
Tillandsia fasciculata	*Swietenia Mahagoni*
Renealmia occidentalis	*Cedrela odorata*
Vanilla phaeantha	*Drypetes lateriflora*
Cecropia sp.	*Spondias lutea*
Pisonia aculeata	*Carpodiptera cubensis*
Oxandra virgata	*Calyptranthes* sp.

The list is necessarily incomplete, but it will serve to show the preponderance of tree species. The greatest number of individuals is found in *Calyptranthes* and *Oxandra*, with certainly other arboreal species coming very close to them. The lack of undergrowth is very marked, and throughout the forest one finds an unbroken succession of ridges and slopes carpeted with little but a covering of dried leaves. The grasses *Arthrostylidium capillifolium*, *Oplismenus hirtellus* and *Pharus latifolius* are the most common herbaceous species, and these with *Renealmia occidentalis* are about the only ones that are frequent enough to be noticed.

The lack of undergrowth is due almost solely to the want of available surface- or drainage-water. There is practically no humus, for the reason that the conditions that will produce it are wanting. We have therefore a dry, almost arid, but well-wooded formation that is devoid of under-vegetation.

Cañons

The gorges are as profusely covered as the adjoining forest-floor is bare and naked. A list prepared from the collections in a typical cañon will give some idea of the species likely to occur in such places:

Helicophyllum sp.
Campyloneurum angustifolium
" *Phyllitidis*
" *latum*
Ceropteris calomelaena
Asplenium pumilum
Doryopteris pedata
Dryopteris sp.
Polypodium Plumula
" *polypodioides*
Anthurium sp.
Philodendron lacerum
Renealmia occidentalis
Epidendrum cochleatum
Pleurothallis Wilsoni
Oncidium sp.
Peperomia rotundifolia
" *acuminata*
" *scandens*
Peperomia obtusifolia
Boehmeria littoralis
Pilea nudicaulis
" *microphylla*
" sp.
Rajania hastata
Drymaria sp.
Picramnia pentandra
Pavonia Typhalaea
Marcgravia sp.
Gilibertia arborea

Wallenia laurifolia	*Psychotria* sp.
Asclepias nivea	*Chiococca parvifolia*
Solanum triste	*Diapedium assurgens*
Hamelia lutea	*Lobelia* sp.
Psychotria lasiophthalma	*Adenostemma Berterii*

But no mere list can give one the least idea of the vegetal wealth and beauty of one of these gorges, and they are all the more striking in contrast with the arid slopes through which they have cut their way. With vines festooned among the trees and shrubs and almost all the trees covered with epiphytes the scene is most beautiful.

These gorges are a fine example of the action of an edaphic factor as a determinant in the plant-covering of a restricted area. The climatic and primary soil conditions are practically identical in the cañons and the slopes. But the water that is at the bottom of all these gorges is almost the sole factor in producing such profusion on the one hand, and the lack of water is certainly the chief cause of such scarcity on the other. The moisture and consequent decomposition of successive generations of herbaceous plants make a rich, damp compost, and we therefore find here a profusion of plants in striking contrast to the poverty of the ridges and slopes.

River Bottoms and Deltas

The sterility of most of the river bottoms, particularly where they spread out to form the delta, is a very marked feature of this region.* With the exception of species of *Plumiera* and a few other tree species, these areas are without arboreal vegetation. A rather rank growth of somewhat xerophytic shrubs and weeds gives the whole river bottom a characteristic appearance not unlike a typical "scrub" of the Bahamas. The line of demarcation between these sterile areas and the well-wooded hills that rise abruptly on both sides is very sharp; and it is quite as much the sudden change as the sterility that will strike the collector. This sterility is caused by the floods that annually wash

* Taylor, N. Botanical Notes on the Vegetation of the High Maestra. Forestry Quarterly 4: 270. 1906.

out the available soil, so that little is left to support a heavier vegetation.

Practically the whole southern slope may be roughly divided into these three areas, the first, of course, being much the largest. And all these are in a great measure controlled by the presence or absence of available surface water. It is, in short, to this edaphic factor that we must turn for an explanation of the barrenness of the slopes, the profusion of the cañons, and the sterility of the river bottoms. With soil, light, and climatic conditions so even throughout this great southern exposure, there is only this instability and inequality of terrestrial water sources that can account for the marked diversities existing among these three types.

It is unnecessary to discuss the strand and littoral, as they are much the same throughout the West Indies and have little to do with the problem of the general or regional distribution of the plants of this area.

Turning now to the windward or northern slope and the ridge of the Maestra, we have entirely different conditions prevailing. Here the northeastern trade-wind keeps the country continually bathed in great quantities of moisture, and the precipitation is heavy. From this constant equality of moisture supply and an almost similar equality of temperature this ridge is an ideal environment for moisture-loving plants of all kinds.

The vegetation forcibly reminds one of the lowland cañons, but it is much more dense; so much more so that without cutting a path it is impossible to scramble through. Many plants occur here that we had never seen at the lower elevations, but the number of species is so great and the time spent here so short, that any list based on the present collections would give no adequate idea of the richness and variety of the flora. Filmy-ferns, tree-ferns, epiphytic orchids and bromeliads, hepatics and mosses, together with many Peperomias, seem to predominate, but the whole effect is one of bewildering complexity and density. The vegetation is evenly distributed at all the points that we visited on the ridge and windward slope, but the line of demarcation in this belt is clearly seen when one begins the descent to the sea, thus leaving the region that comes under the influence of the trade-wind.

It would seem, then, from the foregoing, that in the distribution of the plant groups in this great mountain range, we have not, primarily, a problem of altitude. For the altitude *per se* can scarcely be of much importance as a determinant, for by it no greatly changed conditions of atmospheric pressure are reached, our greatest elevation being nowhere more than three thousand six hundred feet. It is cooler, however, at the ridge than at the coast and this may have some effect on the precipitation, and, secondarily, of course, on the plants.

But the Maestra rises more or less abruptly from the level part of Cuba, and furnishes a great barrier of from three to eight thousand feet in height and about sixty miles long. Its altitude thus at once becomes the all-important factor in regulating the amount of rainfall that gets over to the leeward side of the range. This action of the ridge in monopolizing the better part of the moisture from the trade-wind is responsible for the comparative dryness of the whole southern exposure. The division of the area into regions coming under the influence of this wind and those lacking it, is, therefore, not such an arbitrary proceeding as one might suppose who had not seen this marked example of the importance of the rainfall in determining the general characteristics of any given area. In the variation of the plant associations cited under the discussion of the southern slope other factors must be taken into consideration. But these are almost wholly local in their effect and are not therefore comparable to a factor of the scope and importance of this trade-wind.

New York Botanical Garden.

A NEW BLACKBERRY FROM THE VICINITY OF PHILADELPHIA AND WASHINGTON

By William H. Blanchard

The blackberries in the vicinity of Philadelphia and Washington were studied by the writer in July, 1906. The species found are not numerous. *Rubus hispidus* L. and *R. cuneifolius* Pursh occur, but are not common generally, though *R. cuneifolius* is

abundant on the sandy plains of southern New Jersey; *R. alleghaniensis* Porter (*R. nigrobaccus* Bailey), the common blackberry of New England, is rare; but there are three which are common. Perhaps the most abundant of all is the common dewberry *R. procumbens* Muhl. The southern high blackberry, *R. Andrewsianus* Blanchard, which is common from southern Connecticut and northern New Jersey to North Carolina, is abundant and a prolific bearer. The third in abundance is an undescribed species of the *frondosus* class which seems to have been unnoticed by botanists. Though it often makes a very large plant, it is seldom as tall as *R. Andrewsianus* and in general appearance is a sort of "half high" or intermediate between *R. procumbens* and *R. Andrewsianus.* It may be named and described as

Rubus philadelphicus sp. nov.

Large, round-stemmed, erect-recurving plants, pubescent and glandless, lightly armed, fruit-branches leafy, bearing a fine crop of large, early, much esteemed fruit.

New canes. — Stems stout, hard, erect at first, then recurved, 2 to 4 feet high, 4 to 8 feet long, greenish, glabrous and glandless, terete or nearly so, much branched, the branches recurved and the end touching the ground, or prostrate, few noticed tipping. Prickles few, 4 or 5 to the inch of stem, 0.125 to 0.184 inches long, slender, strong, set at a right angle to the stem and in lines over the pentagonal pith. Leaves 5-foliolate, large ones 9 inches long by inches wide, rather thick, yellow-green, with many appressed hairs, but nearly smooth on the upper surface, slightly whiter, with much pubescence, and velvety below. Leaflets broad, often only the middle ones noticeably stalked, taper-pointed, singly or slightly doubly serrate-dentate, otherwise entire; middle leaflet broadly ovate, rounded at the base or slightly cordate, the side leaflets broadly oval or rhomboidal, wide-cuneate, and the basal ones similar in shape but smaller. Petiole and petiolules stout, grooved, villose-pubescent, glandless; prickles rather numerous, stout and hooked; the petiole of the middle leaflet less than 1 inch long, the side leaflets short-stalked and the basal ones sessile.

Old canes. — Stems hard, prickles intact. Second year's growth consisting entirely of leafy fruit-branches, from 6 to 12 inches long, tipped with inflorescence, the branches graded regularly in length, one from the axil of each old leaf. Axis of branch some-

what zigzag, angled, stout, villose-pubescent, glandless; prickles not numerous, small, stout, and hooked. Leaves trifoliolate, the upper unifoliolate, thickish, of moderate size or small, coarsely dentate, very velvety on the lower surface and nearly smooth above; leaflets broad; unifoliolate leaves very broad and often slightly incised or deeply 2-incised. Inflorescence on a short axis, cymose or cymose-corymbose; pedicels very pubescent, with rarely a few stalked glands, 4 to 8 set at a small angle or erect, and an erect one from the axil of each lower leaf, those composing the cyme subtended by broad unifololiate leaves or some without subtending leaves. Flowers not seen. Fruit ripening before the middle of July, nearly globose, about 0.5 inch in diameter. Very productive, flavor fine. Ripe two weeks earlier than *R. Andrewsianus.*

This is a very abundant plant in the neighborhood of Philadelphia and Lancaster, Pennsylvania, and quite as abundant around Washington, D. C.

This species is closely related to *R. frondosus* Bigelow and needs careful study. It is evidently wide-spread. There was no specimen of it in the National Herbarium at Washington. There was, however, one specimen at the Academy of Sciences of Philadelphia, collected recently by Dr. Ida A. Keller.

WESTMINSTER, VERMONT.

MELANOSPORA PARASITICA

By Guy West Wilson

This interesting species was collected in fair abundance in the vicinity of Van Cortlandt Park, New York City, the present season on *Isaria farinosa* (Dicks.) Fries, the conidial stage of *Cordyceps militaris* (L.) Sacc. Saccardo's Sylloge Fungorum contains the descriptions of two species of ascomycetous fungi which occur upon this host. A comparison of the descriptions led to the discovery that the characters given are insufficient to warrant the separation of these species. The first mention of this fungus is by L. Tulasne who described it as *Sphaeronema parasitica** on *Isaria crassa* from France. A few years later the brothers

* Ann. Sci. Nat. IV. 8: 40, note 2. 1857.

Tulasne transferred the species to the genus *Melanospora* and published a complete series of figures.* The next record of the occurrence of this fungus is by Plowright † who records it upon *Isaria farinosa* in England. He redescribes and refigures the species. Aside from the arrangement of the spores in the ascus the two accounts are essentially the same. Saccardo ‡ questions the correctness of this disposition of species and suggests that it probably belongs to *Ceratostoma* on account of its light-colored perithecium.

The first mention of the species from America is by Ellis and Everhart § who described it as *Ceratostoma biparasiticum* from material sent from Ohio by C. G. Lloyd. The material collected this season agrees with the description and the type specimen of the American species and equally well with the description of the European. The only points of difference are such as would be expected from two observers working on two continents independently of each other. The European species is described as having hyphae about 3.5 μ in diameter, spores 5–6 $\mu \times 2.5\ \mu$ and perithecia about 200 μ in diameter with a beak about 40–50 $\mu \times$ 1000–2000 μ while the American species has hyphae about 3 μ, spores 6–7 $\mu \times 1.5\ \mu$ and perithecia 80–100 μ with a beak 30–40 $\mu \times 1000\ \mu$. The brothers Tulasne had abundant material fróm which to describe their species as they not only collected it in its native haunts but cultivated it in the laboratory, while the type in the Ellis herbarium consists of a single plant of *Isaria* parasitized only at the base and containing at most a small number of perithecia. In a series of some half dozen or more infested plants of *Isaria* it is not difficult to find all regions of the host parasitized and perithecia with a considerable range in size. The American material is somewhat smaller than the European but otherwise the same. The perithecia are usually intermediate in diameter between the measurements given in the two descriptions and range from 1000 to 1500 μ in height.

* Sel. Carp. Fung. **3**: 10. *pl. 3. f. 11–14.* 1865.

† Grevillea **10** : 71. *pl. 158. f. 3.* 1881.

‡ Syll. Fung. **2** : 464. 1883.

§ Bull. Torrey Club **24** : 127. 1897.

The problem of specific identity is by no means so complicated as that of generic relationship. That our fungus is not a *Sphaeronema* is evident from its production of ascospores, but its place in the one or the other of the two remaining genera to which it has been referred is not so easily decided, as they are very similar even though they belong to supposedly very different orders. In each case the perithecium is flask-shaped with a very long beak, rather light in color although appearing quite black to the naked eye. In *Melanospora* the perithecia are isolated, with a cottony stroma, which is sometimes wanting or poorly developed, and have the ostiolum surrounded by a fringe of hairs. In *Ceratostoma* the perithecia are also isolated, the stroma and fringed ostiolum are absent and paraphyses are usually present. The spores and asci are similar in both genera. In hope of assistance from a comparison of the material at hand with the types of the genera in question their history was traced. The genus *Ceratostoma* was founded by Fries on *Ceratospermum* Mich., which had *C. nigrum* Mich. (= *Ceratostoma pedioides* Fries) as the type*. This species has hyaline spores and is now known as *Valsa ceratophora* Tul. It is therefore evident that if our species is a member of the genus *Ceratostoma* as at present accepted it does not belong to the Friesian genus of that name. A further search shows that unless the species now assigned to that genus belong to *Ceratostomella* Sacc., from which they are distinguished only in spore-color the genus is without a name. The genus *Melanospora* was founded by Corda † with *M. Zamiae* as its type. With this species the one in question is undoubtedly congeneric. The synonymy of the species is as follows:

MELANOSPORA PARASITICA L. Tul. & C. Tul. Sel. Fung. Carpol. **3**: 10. 1865.

Sphaeronema parasitica L. Tul. Ann. Sci. Nat. IV. **8**: 40, note 2. 1857.

Ceratostoma biparasiticum Ellis & Everh. Bull. Torrey Club **24**: 127. 1897.

* Obs. Myc. **2**: 337. 1818.

† Icones Fung. **1**: 24 *pl.* 7. *f.* 297 *A*. 1837.

SHORTER NOTES

THE SCIENTIFIC NAME OF OUR COMMON HUCKLEBERRY. — In 1787, Wangenheim (Beitr. Am. 30. *pl. 39. f. 69*) published a description of a plant named by him *Andromeda baccata.* The figure of the plant is a fair one, and from it and the description there is no doubt that the plant so named is the common American huckleberry. Two years later, Aiton (Hort. Kew. **2**: 12) published the name *Vaccinium resinosum* for the same plant, and when in 1843 the plant was referred to *Gaylussacia* by Torrey & Gray (Torr. Fl. N. Y. **1**: 449) the combination *Gaylussacia resinosa* was made. Since that time the plant has appeared in American botanies as *Gaylussacia resinosa* (Ait.) T. & G., but the above synonymy and the correct name of our plant were noticed many years ago by K. Koch (Dendrol. **2**^{1}: 93. 1872), and it would seem to be proper for American botanists now to adopt the name published by him for this common and well-known plant, namely *Gaylussacia baccata* (Wang.) K. Koch.

In like manner, the form published by Professor Robinson as *Gaylussacia resinosa glaucocarpa* (Rhodora **2**: 83) should become **Gaylussacia baccata glaucocarpa.**

KENNETH K. MACKENZIE

EAST ORANGE, NEW JERSEY.

A NEW LENTINUS FROM PENNSYLVANIA.—**Lentinus pulcherrimus** sp. nov. Pileus entire, coriaceous, umbilicate, indistinctly marked with concentric zones, covered with fascicles of yellowish tan-colored hairs, the fascicles arranged in radiating rows, giving the pileus a corrugated appearance; margin inflexed, 2 cm. broad, covered with lanate hairs; flesh white, scarcely 1 mm. thick; gills white, narrow, subdistant, rounded behind, free, margin entire; stem central, concolorous with the pileus, tomentose, equal, solid, white within, 3 cm. long, 1.5 mm. thick; spores white, broadly ovate; odor fetid, especially in drying, finally disappearing, somewhat like the odor of *Claudopus nidulans.*

Growing on buried sticks, Kittanning, Pa. July, 1904.

Type specimens are in the Carnegie Museum, Pittsburgh, Pa.

In general appearance the plants resemble specimens of *Coltricia cinnamomea* (Jacq.) Murrill, and might be mistaken for that

species. It is also closely allied to the following tropical species, *L. villosus*, *L. siparius*, *L. sparsibarbis*, *L. pyramidatus*. The following table will aid in distinguishing the different species:

	Pileus with two kinds of hairs, lanate and rigid	1.
	Pileus not as above	2.
1.	Pileus yellowish tan-colored, slightly umbilicate	*L. pulcherrimus*
1.	Pileus orange, deeply umbilicate	*L. siparius* B. & C.
2.	Hairs of pileus in pyramidal fascicles	*L. pyramidatus* B. & C.
2.	Hairs of pileus fascicled toward center, scattered and depressed	*L. sparsibarbis* B. & C.
2.	Hairs of pileus not fascicled	*L. villosus* Klotzsch

DAVID R. SUMSTINE.

WILKINSBURG, PA.

A NEW SPECIES OF EVOLVULUS FROM COLOMBIA. — The following new species was detected among the specimens of *Evolvulus* in the National Herbarium at the time the three Mexican species described by the writer * were studied:

Evolvulus sericatus sp. nov.

§ Alsinoidei. Stems herbaceous from a perennial root, erect, 3–5 dm. tall, slender, usually branching above; stem silky-hirsute with appressed hairs; leaf-blades sessile or the petioles less than 1 mm. long, narrowly oblong-lanceolate, usually broadest near the middle, 1–2 cm. long, about one-third as wide, rounded or obtuse at the base, the apex obtuse and submucronate, densely and finely appressed silky-villous above, more densely so beneath, both the lower and the upper leaves somewhat reduced; peduncles exceeding the subtending leaves, 1.5–2.5 cm. long, 3–9-flowered, bracts subulate, long-tipped, about 2 mm. long; pedicels 6–8 mm. long; sepals ovate-lanceolate, acuminate, 3–3.5 mm. long, densely silky-pubescent with subappressed hairs, the tips erect in fruit; corolla nearly rotate, 6–7 mm. broad, entire, blue with white plicae, the plicae hirsute without; capsules globose, 2-valved, 4-seeded; seeds glabrous, dark-brown, minutely roughened.

COLOMBIA: Papagayeras, 800 m. alt., *E. Langlassé, no. 12*, November 4, 1899. Type in the herbarium of the United States National Museum.

Related to *E. villosus* Ruiz & Pav., from which it differs by its

* Bull. Torrey Club 33: 315–317. 1906.

appressed silky pubescence and few-flowered peduncles. So many species of *Evolvulus* of northern South America extend into Central America and the West Indies that it is possible the species here described may be found in Panama or Central America.

HOMER D. HOUSE.

CLEMSON COLLEGE, SOUTH CAROLINA.

REVIEWS

Scott on the Present Position of Palaeozoic Botany*

Band I, Heft I, of Progressus Rei Botanicae published by the International Association of Botanists under the editorial supervision of Dr. J. P. Lotsy promises to be of very considerable value, if one may judge from the initial instalment. Leaving it to others to characterize the merits of Strasburger's and of Flahault's contributions, I wish to direct attention to the very valuable summary by Scott of "The Present Position of Palaeozoic Botany."

Paleobotany has been to such a large extent divorced from botany in the past and so largely ignored by botanists that I am sure that this summary will be read with surprise by a goodly number who have heretofore looked upon paleobotany with somewhat of disdain as a science engaged in the more or less questionable occupation of describing fragments of prehistoric plants whose identification is more or less uncertain. Granting that identifications are oftentimes not all that might be desired, and it may be remarked parenthetically that this shortcoming is not the exclusive possession of those who deal with fossil plants, nevertheless the fact remains that the number of fossil plants in some orders, as for instance the Cycadales, far exceeds their living representatives; other orders are wholly unknown in the modern flora (Sphenophyllales, Cordiatales); while in still other groups the modern representatives are but mere remnants of once large and complex assemblages whose existence would not have been

*Scott, D. H. The Present Position of Palaeozoic Botany. Progressus Rei Botanicae 1 : 139–217. 1907.

dreamt of were it not for the study of fossil remains. I refer to the Equisetales and Lycopodiales. While not holding a brief for the study of paleobotany, the prediction is eminently true that in a few years' time it will be as much of an absurdity to pretend to discuss the broader questions of morphology, systematic botany, or geographical distribution without taking paleobotany into account as it is now for a zoölogist to discuss the morphology, classification, or geographical distribution of mammals without an intimate acquaintance with Tertiary vertebrate paleontology.

The limits and relative development of the various classes in the Paleozoic were so different from what we are familiar with in modern floras and the time involved was so enormous, that it is difficult properly to orient oneself; we forget that Paleozoic time was longer than all time since its close, and that it undoubtedly afforded opportunity for the evolution of structures and habits far beyond what we have been accustomed to imagine.

In the study of Paleozoic floras, discovery has trod upon the heels of discovery during the past few years so that the present summary of a scattered and special literature is not only timely, but coming as it does from the pen of one who is such a master workman in the ranks of investigators in this field, it possesses an added value and authority. After a brief introduction the various groups are taken up in a systematic order, commencing with the algae and ending with the Gymnospermae, the treatment being mainly morphological and evolutionary. Space forbids an extended notice. The work itself is succinctly condensed and should be on the work-table of every botanist. A few points may be merely enumerated.

The probable abundance of Carboniferous fungi and the total absence of authentic Bryophyta is noted, the latter fact somewhat puzzling to those who assign so great a theoretical importance to this sub-kingdom. Interest centers in the vascular plants and it is pointed out that their division into Pteridophyta and Spermatophyta ceases to be a natural one with the discovery of the Pteridospermatophyta. Thus these terms are likely to follow the Cryptogamia and Phanerogamia into the limbo of disuse before many years. Seed-like organs in two very different genera of

Paleozoic lycopods (*Lepidocarpon*, *Miadesmia*) would seem to indicate that a variety of quasispermatophytic Lycopodiales await future discovery. Considerable space is devoted to the Filicales and stress is laid upon the new viewpoint resulting from the recent discoveries which have so greatly restricted the Filicales, their position in the Carboniferous flora becoming subordinate instead of dominant. True ferns of the family Botryopterideae are, however, described in detail. It may be remarked that the present state of opinion is preëminently transitional and unsatisfactory and, as it seems to me, is destined to considerable future modification. The Pteridospermatophyta or fern-like seed plants are described in considerable detail and will more than repay a careful perusal. The Gymnospermae are treated with great briefness since there is little of novelty to record.

With these few hints at the rich gleanings which await the student, this very brief and inadequate notice is brought to a close.

EDWARD W. BERRY.

MARYLAND GEOLOGICAL SURVEY.

PROCEEDINGS OF THE CLUB

JANUARY 30, 1907

The second regular meeting for the year 1907 was called to order at the museum building of the New York Botanical Garden at 3:30 P. M., with Vice-president Underwood in the chair. Twenty-three persons were present.

A brief account of the reception given by the Club on December 26, 1906, and the minutes of the annual meeting, January 8, 1907, were read and approved by the Club.

The name of Miss Ruth Price, 19 East 48th Street, was presented for membership.

Under "unfinished business," the annual reports of the recording and the corresponding secretaries for 1906 were presented and accepted.

Resignations were received and accepted from the following persons: Mr. F. H. Blodgett, Baltimore, Md.; Mr. Charles L.

Case, 56 Wall St., New York City; Sarah B. Hadley, South Canterbury, Conn.; Mrs. Katherine Winthrop Kean, 25 East 37th St., New York City.

The following amendment to the Constitution, proposed by Dr. J. H. Barnhart at the preceding meeting of the Club, came up for discussion and was unanimously adopted:

"That Article III of the Constitution be amended by the substitution of the word 'eight' for the word 'seven,' so as to read, 'associate editors, not to exceed eight in number.'"

The attention of the Club having been called to the fact that Dr. H. H. Rusby, elected at the meeting of December 11, 1906, to represent the Club in the Council of the New York Academy of Sciences, was already a member of the Council, Vice-president L. M. Underwood was elected as the Club's representative on the Council.

The secretary presented the matter of the Club's record of its membership and on motion the secretary was empowered to prepare a card catalogue of the members with pertinent data, to be kept in the custody of the secretary.

On motion, the secretary cast the ballot of the Club electing Miss Ruth Price to membership.

Dr. C. B. Robinson was nominated as associate editor, and on motion the secretary cast the ballot of the Club electing Dr. Robinson.

Dr. Marshall A. Howe, who had returned on that day from the island of Jamaica, gave an account of his experiences there during the disastrous earthquake of January 14, 1907.

The announced scientific program was as follows:

"New or Rare Mosses from Jamaica," by Mrs. N. L. Britton.

Mrs. Britton exhibited some of the most interesting mosses collected in Jamaica, showing several genera and subgenera not heretofore known in the West Indies, and several new species, and also indicated reductions of some names to synonymy. There were also shown specimens of types of Jamaican species from the Mitten Herbarium and one of Miss Taylor's drawings of a new species and subgenus.

"The Probable Function of Tannin in Galls," by Dr. Melville T. Cook.

The origin, chemistry, and uses of tannin have been studied very extensively, but other phases of the subject have received comparatively little attention. This is especially true concerning the functions which it serves in the plant. It is usually very abundant in diseased tissues, such as insect galls, fungus galls, fungus spots, etc. In insect galls it is developed very early and in some cases it appears to result in the gall-makers moving to other parts of the plant. It is also formed in fungus galls, frequently surrounding the point of rupture. In such fungus spots as those produced by *Cercospora* the successive circles are due to the depositing of the tannin within the tissues. The speaker has made extensive studies on the anatomy of both insect and fungus galls and is now conducting a series of physiological experiments.

C. Stuart Gager,
Secretary.

Feburary 12, 1907

The Club was called to order at the American Museum of Natural History, with President Rusby in the chair. Ten persons were present.

The reading and approval of the minutes of the meeting of January 30, 1907, was followed by the presentation of the name of Mrs. J. S. Ehrich, 1 West 72d St., New York City, for membership.

The president appointed the following committees for the current year:

Finance. — Judge Brown and Professor Richards.

Admissions. — Professor Burgess, Dr. Small, Dr. Curtis.

Local Flora. — (Phanerogams), Dr. Britton, Mr. Bicknell, Miss Mulford, Mr. Eggleston, Mr. Schneider; (Cryptogams), Professor Underwood, Dr. Howe, Dr. Murrill, Mrs. Britton, Mr. Williams.

Program. — Dr. Howe, Professor Underwood, Mrs. Britton.

Field Meetings. — Mr. Wilson, Mr. Nash, Mr. Vreeland.

Referring to the subject of the work of the committee on the local flora, the need of more active work was urged. To this end, a motion was made and seconded that the committee be empowered to appoint additional members to facilitate additional

study of the local flora and the enlargement of the herbarium of the Club. The motion was unanimously carried.

The secretary cast the ballot of the Club electing Mrs. J. S. Ehrich to membership.

The following scientific program was presented:

"Source of Nutrition of Submerged Aquatics," by Dr. Raymond H. Pond. Dr Pond gave an interesting account of his investigation of this problem, in which it was ascertained that submerged aquatic plants, when rooted in the soil, obtain nutriment from the latter, and so, in time, become contributors to the food content of the supernatant water. The advantage which thus results to the associated plankton, and consequently to the local fish fauna, was pointed out. These investigations also demonstrated the possession, by rooted aquatic plants, of abundant root-hairs, contrary to the previous general supposition. These results have been published in the U. S. Fish Commission Report for 1903, pp. 483 to 526.

An interesting discussion followed.

"Some Wound Reactions of Plants," by Professor H. M. Richards. A popular exposition was given of the physiological effects of the wounding of plants.

The Club adjourned at 10 P. M.

C. STUART GAGER,
Secretary.

NEWS ITEMS

Dr. K. M. Wiegand, of the department of botany of Cornell University, has been appointed associate professor of botany in Wellesley College.

The death of J. Schneck, M.D., of Mt. Carmel, Illinois, is reported. Dr. Schneck wrote a "Catalogue of the Flora of the Wabash Valley," and contributed several shorter botanical papers to various journals.

Dr. John A. Shafer, museum custodian of the New York Botanical Garden, returned on March 2 from a collecting expedition to the island of Montserrat of the British West Indies.

Five weeks were spent on this island and a few days on the island of Antigua.

Muhlenbergia, with No. 1 of Volume 3, January, 1907, becomes a monthly journal. It has hitherto been chiefly a medium for the publication of the researches of its editor, A. A. Heller, of Los Gatos, California, but will now be open to contributions from the general botanical public. The subscription price is one dollar a year.

Dr. Auguste-François-Marie Glaziou, for many years director of the Public Gardens of Rio Janeiro, died at Le Bouscat, near Bordeaux, in the latter part of 1906, aged 73 years. He was an indefatigable and most successful collector of Brazilian plants during his thirty-five years' residence in that country. His collections have been studied and described chiefly by others, but he wrote a "Liste des Plantes du Brésil Central recueillies in 1861–1895," which was in the course of publication in the *Mémoires de la Société Botanique de France* at the time of his death.

Beginning with Volume 10 (1907) *The Plant World* will be published under the direction of an association of twelve botanists, consisting of Professor J. C. Arthur, Miss M. M. Brackett, Dr. N. L. Britton, Dr. W. A. Cannon, Professor W. F. Ganong, Professor D. S. Johnson, Dr. B. E. Livingston, Professor F. E. Lloyd, Dr. D. T. MacDougal (chairman), Dr. W. B. McCallum, Professor V. M. Spalding, and Professor J. J. Thornber. Official relations with the Wild Flower Preservation Society of America will be discontinued, but the scope of the journal will be enlarged by including more notes and news of botanical interest, accounts of explorations, illustrations of experiments, discussions of evolution and plant-breeding, etc. The subscription price is still one dollar a year and Professor Francis E. Lloyd, of the Desert Botanical Laboratory, Tucson, Arizona, remains managing editor.

Vol. 7 No. 4

TORREYA

April, 1907

LOCALIZATION OF PLANTS IN THE FINGER LAKE REGION AND THE ADJACENT ONTARIO LOWLANDS OF CENTRAL NEW YORK *

By W. W. Rowlee

Central New York consists in general of two physiographic districts, the western plateau to the southward and the Lake Ontario lowlands to the northward. The former is an elevated country traversed by valleys most often but not always trending north and south, the latter an undulating plain. The prevailing soil is clay in the hills, and sandy or gravelly loam in the lowlands. The lakes of the two regions also differ in their general character. Those of the hill region are long and narrow and deep and enclosed by abrupt hills; those of the lowlands are shallow, often contain islands and shallow bars, and have low shores. The lake system of this region has often been designated the Finger Lake region, with Oneida Lake as the "thumb." Oneida and Onondaga lakes of the lowlands, however, differ from those of the uplands, not only in elevation, mode of formation, and shore characters, but also in the flora they support. They are, in reality, pools left behind when the Greater Lake Ontario subsided to its present limits. Their shores are not abrupt, nor do they rise to any considerable elevation. Oneida Lake has several islands that are wooded, the most noted being Frenchman's Island, toward its western end. It has also what the fishermen call "Blind Islands," islands that appear above the surface when the water is low but are submerged at high water. The lake, moreover, is full of stony and sandy bars,

* Contribution no. 121 from the Botanical Department of Cornell University.

[No. 3, Vol. 7, of Torreya, comprising pages 49-68, was issued March 19, 1907.]

differing from the blind islands only because of their distance below the surface of the water. These bars are the favorite fishing grounds in the lake. The resemblance of the Blind Islands to the summits of the hills in the lowlands which bore the same relation to the former Greater Lake Ontario, shows at once that the old lake must have been full of blind islands. Islands of the same character exist near the outlet of Lake Ontario and on the north shore but none on the south shore.

One of the striking features of plant distribution is the common fact that some species of plants are widely and continuously disseminated, while others occur only in remote and limited localities. The latter are often designated rare species. In some cases species are rare in one region and abundant in another, so it may not be undesirable to use the expression in our title to designate the well-known condition where plants are confined to small areas. Plants of this description fall into three groups:

1. Plants of recent introduction.
2. Plants requiring peculiar conditions.
3. Plants with no apparent cause for limited range.

PLANTS OF RECENT INTRODUCTION.—Plants are localized upon their introduction into new regions. The rapidity with which they spread depends largely upon the capacity of the plant to spread by seed dissemination or otherwise.

Three species introduced into the region under discussion illustrate this very well.

Hyoscyamus has been known to occur on the fort grounds in Oswego for many years. It has not gotten beyond their limits yet.

Erythrea Centaurium was introduced at Oswego, how long ago, no one knows; some have surmised as early as the French domination of Canada. In 1880 it had spread into every neighborhood within a radius of ten miles, and it may now be found even twenty miles from the city. Beyond these limits it is not known in central New York.

In 1888 a few limited localities for *Hieracium aurantiacum* were known in Oswego Co. It seems to have been there as early as in any place in the state. Now it is everywhere, and is beyond doubt one of the most pernicious and persistent weeds in the state.

Of these three, the last plant to be introduced has attained by far the widest distribution, just because it possessed qualities enabling it to thrive and spread.

Plants Requiring Peculiar (usually Edaphic) Conditions. — There are several localities in this region where soil conditions are peculiar, and in these places, species, often groups of species, appear that do not occur elsewhere. Peat-bogs, localities about salt springs, marl-formations, and sand-dunes, all have species peculiar to them, and all are represented in the region. Many of the species found in these places are identical with species found along the Atlantic coast, and this led Paine, in his Catalogue of the Plants of Oneida County, page 133, to conclude that "their presence here is proof, first, that the sea originally came up to and covered the place; and, second, that these plants were flourishing at that time." That plant migration may account for the occurrence of these plants inland, is highly probable. Nevertheless, the number of species involved and the isolation of the areas from the ocean and from each other would seem to lead naturally to Paine's conclusion. Peat-bogs have been the subject of many recent investigations. In the American Naturalist, the writer has discussed the distribution of the peat-bog flora in the Lake Ontario lowlands and pointed out the occurrence in them of a considerable element representing plants of the Atlantic coast. The salt-water plants of Onondaga Lake and Salt Creek, near Montezuma, have been discussed by Clinton, Paine, and others. The flora of the marl-formations of Junius, Seneca County, as well as Bergen Swamp, have been discussed by Judge Day and Professor Dudley and in the Flora of Monroe County. Nothing has been published on the floras of the sand-dunes at the eastern end of Lake Ontario. The plants and conditions under which they grow are practically identical with the plants and conditions as set forth by Cowles and others in their accounts of sand-dune regions about Lake Michigan. The affinity of this region to dune regions of the Atlantic coast is obvious, as shown by the presence of a long list of identical species.

Sylvan Beach in Oneida Lake is an extensive sandy beach on which also occur many of the species found in the sand-dunes of the Great Lakes and the Atlantic coast.

Plants with no Apparent Cause for Limited Range. — Excluding plants of the two categories already discussed and taking up plants with no apparent reason for their limited range, it will be found that there are few if any plants endemic to this region, — also that there are still many localized species. The reason for their present distribution is an interesting subject for consideration.

In the first place it may be pointed out that while both the highland and lowland regions have many localized plants, one and the same species is scarcely ever localized in both regions. Either a localized species of the uplands does not occur in the lowlands, and *vice versa*, or a species localized in the highlands will be relatively abundant in the lowlands, and *vice versa*.

Many species could be taken to illustrate this. A few will suffice:

	Uplands	Lowlands
Sagittaria subulata	none	rare
Rhexia virginica	"	"
Jeffersonia	rare	none
Hydrastis	"	"
Eleocharis mutata	none	rare
Juncus subterminalis	"	"
Solidago lanceolata	rare	abundant
Panicum clandestinum	"	"
Decodon verticillatus	"	"

Another interesting thing is the fact that the localized species of the highland region occur with few exceptions in wooded uplands while those of the lowlands are confined to the lakes and water courses and their immediate vicinity. Thus *Prosartes* and *Mertensia* are localized in the highland region and do not occur in the lowlands, while *Hemicarpha*, *Dianthera*, and *Spartina* are localized in the lowlands and do not occur in the highlands.

Looking for the causes for the rarity of these plants, we may at once eliminate climate, as the climate, both as regards temperature and humidity, is practically uniform for both regions. That edaphic factors play an insignificant part seems probable, although

the lowland region has a much more sandy soil than the upland. That the localized plants of the lowland region were brought in by aquatic birds or other animals from the Atlantic coastal regions through the Hudson and Mohawk valleys seems most probable, since these valleys form a natural water-way in this region. The localized plants are at the extreme limit of their northern range. The waters have not only facilitated introduction but tended to modify temperature, thereby enabling these species to maintain a foothold. What water has done for the localized plants of the lowlands the leaf-mold of the forest floor has done for the localized plants of the uplands.

CONCERNING WOODWARDIA PARADOXA, A SUPPOSEDLY NEW FERN FROM BRITISH COLUMBIA

By L. M. Underwood

European fern study neglects or denies the usefulness of two features that American botanists have learned to make of prime importance. The first of these is *type locality* and the second is the necessity of *accurate citation*. Not long ago the writer had occasion to deliver a polemic on some of the carelessness of continental botanists with regard to this matter.* Two years ago I was told by the worker at Kew, whose latest utterance I am here obliged to criticize, that there was enough to do of "real work" not to make it needful "to be hunting up old names, types of genera and species, and type localities." It is just this neglect of old names and type localities that causes some of my British friends to play fast and loose in the matter of making useless redescriptions of plants as new that were long since described. Some time ago† I called attention to the fact that when Baron Eggers collected a *Lygodium* in Hispaniola, the first thing Mr. Baker did was to describe it as new without stopping to look up Hispaniola as a type locality for other possible species of

* A much-named Fern. Torreya **5**: 87–89. 1905.

† Bull. Torrey Club **29**: 620. 1902.

Lygodium. This we have since been obliged to do, and quickly found that as early as 1810 Willdenow had described *Hydroglossum oligostachyum* (*Lygodium oligostachyum* Desv.), based on Plumier's figure of 1703, from that island. On comparing Eggers' plant with that plate it matched exactly and so *Lygodium gracile* Baker fell into needless synonymy.

Now we have an even more aggravated case from our American northwest coast from which one would naturally be wary in describing new species of ferns, since it has been well collected over since the time of Menzies, Scouler, and Douglas. However, a plant from an Irish greenhouse cultivated from British Columbia comes to Kew and it is promptly described as a new species, *Woodwardia paradoxa* Wright, * apparently without looking up either recent American literature on the subject, or what is still more important, the literature of the past generation. This is all the more inexcusable now, for we have Christensen's admirable *Index Filicum*, and while it fails to give the type locality of the species it catalogues, it nevertheless gives citations accurately, so that anyone who wishes to avoid duplication of names can do so with a minimum of extra labor. Since the possibilities of American fern cultivation have become extensive, and we have had opportunity to cultivate *Woodwardia radicans* of the Old World side by side with the plant of the Northwest, we have been able to see at once, as Mr. Wright has also done, that the two species are absolutely distinct. Instead of dashing off a description of a new species, the first thing the American does is to look up the synonymy and type localities of any species that the writers of the past have needlessly reduced to synonymy. We naturally commence with the Hookerian school of fern students, whose proclivities for lumping species into general synonymy are notorious, and whose work has served to mislead the fern world by their hasty practices. We easily found that two species had been thus reduced: (1) *Woodwardia Chamissoi* Brack. (1854) with a type locality in "Monterey and San Francisco; also in mountains, on the upper waters of the Sacramento River, California," and (2) *Woodwardia spinulosa* Mart. & Gale-

* Gardeners' Chron. III. 41 : 98. 16 F 1907.

ott. (1842) with a type locality, Orizaba, Mexico. Since 1900 Americans have not only considered these plants distinct from the *Woodwardia radicans* of the Old World, but have considered them as synonyms after an examination of a wide series of material from the entire range of the Sierra foothills from Guatemala to British Columbia.* Taking, however, only the species whose type locality is nearest British Columbia, let us see what Brackenridge wrote about it over fifty years ago. He says, among other things (Wilkes' Expl. Exped. Botany **16**: 189. 1854): "Veins of a pale color, transparent, and not anastomosing more than twice; the venules towards the margin parallel and free." These are exactly the characters on which Mr. Wright depends for his so-called new species.

But Brackenridge says further: "This has been referred by Kaulfuss to the *Woodwardia radicans* of Swartz [*sic*] in which he is followed by Hooker and Arnott, in the Botany of Beechey's Voyage; while we cannot but consider the Californian plant as a distinct species, on account of the erect fronds, the total absence of any proliferous bud on the rachis, the more falcate segments, with a wide sinus, rounded at the base, and the pale veins which are not so compoundly reticulate." In this he almost exactly reproduces a number of Mr. Wright's secondary characters. *Woodwardia paradoxa* is thus the third name for our West American chain-fern.

Everyone will make mistakes sometimes but after the necessity of searching type localities, making exact citations, examination of types, and care of existing synonymy has been hammered into the heads of Europeans for a decade, why will they go on and make needless synonyms after this fashion, especially in such small genera as *Woodwardia*? I am sure the English practice in the seed-plants is not like this, at least so far as it relates to American plants, but among the ferns, the Hookerian system of the past seventy years has reduced species to synonymy to redescribe them anew over and over again. Fee's works at Kew are pen-

* *Cf.* Maxon. List of Ferns and Fern Allies of North America, North of Mexico. Proc. U. S. Nat. Mus. **23**: 635. 1901; also Christensen, Index Filicum, 658. 1906.

cilled after his new species "= this or that species" and a lot of them have been redescribed as new, when the plant actually came to hand. Is it any wonder that Christensen has over 22,000 names for a little less than 6,000 plants? The practical lesson of the story is:

1. Make a study of geographic distribution in its relation to specific limitations.*

2. Consider type locality as a fundamental part of a plant description. It is the lack of this element that makes Christensen's *Index* just short of the ideal.

3. Beware of any species with a wide range as recorded in *Synopsis Filicum* or that has an extended synonymy † either there or in *Species Filicum*; there are few species of world-wide distribution and there will be sure to be something wrong with wholesale slaughter; these are danger marks not to be disregarded.

4. Synonyms and homonyms are still important factors in taxonomy.

We commend the above suggestions to the prayerful attention of European fern students.

A HYBRID LESPEDEZA

By Kenneth K. Mackenzie

Ten years ago, while on a botanical trip in southern Missouri, I ran across a procumbent *Lespedeza* with yellowish flowers. The plant was rare and was referred to *Lespedeza hirta* (L.) Ell., with many misgivings. Later, in an article on the Lepedezas of Mis-

* Scores of plants from America have been referred to species originally described from Mauritius. Such a conception of geographic distribution is absurd on the face of it, and every new examination of types from the two countries only serves to confirm their distinctness. One great desideratum of American fern students to-day is authentic material from Mauritius to enable us to straighten out the Hookerian muddles of just this sort.

† In the present case the citation of Brackenridge was more simple at Kew than it would be in New York, since Kew is one of the fortunate institutions that possesses a copy of the rare work of Brackenridge on the Ferns of Wilkes' Exploring Expedition. Here at New York we have to consult the nearest copy at New Haven, or else as in the present instance trouble Yale's obliging professor of botany, Dr. A. W. Evans, whose kindness in furnishing quotations I most thankfully acknowledge.

souri (Trans. St. Louis Acad. Sci. **12** : 11) Mr. B. F. Bush and myself were obliged again to refer this plant as above, as "a slender decumbent form."

In the years since this collection I had never until this last year seen another specimen of this peculiar plant either living or in any herbarium. My pleasure therefore can be imagined when in botanizing on the high rocky hill about a mile to the west of the D. L. & W. R. R. station at Mt. Arlington, Morris County, New Jersey, the plant was again found in much the same situation as before. Again it was rare, but the one or two plants seen were large, vigorous, and conspicuous. In aspect the plants had a strong resemblance to *Lespedeza repens* (L.) Bart., the long procumbent stems spreading for a distance of 5–9 dm. in every direction from a common center. The yellowish-white flowers and the longer sepals, however, at once showed that the plant could not be referred here. On the other hand, the procumbent character of the plant, its much greater slenderness in all its parts, its much less developed inflorescence and shorter, less hairy sepals forbade its continued reference to *Lespedeza hirta*. In fact, it can best be described as very nearly exactly intermediate between the two widely separated species referred to above.

In view of the rarity of the plant, of its occurrence in both stations where found with *Lespedeza hirta* and *L. repens*, and of its intermediate characters, I have come to the conclusion that this plant is a natural hybrid between these two species and would here describe it as follows :

Lespedeza hirta × repens

Perennial with many procumbent stems 6–9 dm. long, radiating from a common center : stems pubescent, but little branched, slender : leaflets oval or elliptic, strongly appressed-pubescent on both sides, the larger 2–2.5 cm. long, about 1.5 cm. broad, rounded (not retuse) at apex, mucronulate, exceeding the petioles : flowers in slender rather few-flowered spikes, on peduncles 2–5 cm. long and much exceeding the leaves : sepals appressed-pubescent, the margins ciliate, linear-lanceolate, 3 mm. long, about one-half the length of the corolla : corolla yellowish-white, the standard with a purplish spot in the center, and the tips of the

wings and keel more or less tinged with purple; wings and keel nearly equal, exceeded by standard: either abortive petaliferous spikes or undeveloped apetalous flowers occur in the axils of some of the petioles: no pods seen.

Specimens seen: New Jersey, Mt. Arlington, *no. 2328, Mackenzie*, 26 August, 1906; Missouri, Eagle Rock, *Mackenzie*, 28 September, 1896.

SHORTER NOTES

Corallorhiza maculata Rafinesque. — In *Leaflets* (**1**: 237. 1906), Professor Greene takes up the name *Cladorhiza maculata* Raf. (Am. Mo. Mag. **1**: 429. 1817) for the species long known as *Corallorhiza Wisteriana* Conrad (Journ. Philad. Acad. **6**: 145. 1829), and makes what purports to be the new combination *Corallorhiza maculata*. Rafinesque's description, though brief, cannot, as Professor Greene indicates, refer to any other species of the genus in the northeastern states. That Rafinesque first noticed the species in the vicinity of Philadelphia, as Professor Greene surmises, seems doubtful in the light of a second note by Rafinesque, in which he writes:

"*Coralorhiza maculata.* Roots branched, palmate articulate, stem round, sheaths acute; raceme loose, flowers drooping, sepals lanceolate, nearly obtuse, labellum recurved elliptic white, red spotted, auriculated on each side of the base, toothed and obtuse at the apex. * * * This grows in the shady woods of Long Island near Flatbush, Flushing, Oyster-bay, etc.: it blossoms in July and August, the whole plant is yellowish, size about one foot." (Am. Mo. Mag. **2**: 119. D 1817.) This gives a definite type locality for the species and it would be interesting to know whether the species is still to be found in the localities indicated by him.

Homer D. House.

Clemson College, S. C.

Ipomoea triloba L. in the Philippines. — In 1837, Blanco described a Philippine plant, which seemed to him distinct from any Linnaean species, as *Convolvulus dentatus*. As this name

was long preoccupied by a species of Vahl, it was changed by Choisy to *Ipomoea Blancoi*, which name has since been used. The compilers of the third edition of the *Flora de Filipinas*, not suspecting the identity of Blanco's species, enumerated and figured it as *I. commutata* Roem. & Schult., to which it is very closely allied. By Choisy, who knew it from the original description only, it was included among the species insufficiently known, but recently abundant material has been collected, and some time ago Mr. Percy Wilson called my attention to its resemblance to the tropical American *I. triloba*. Investigation showed that nearly parallel series of its somewhat wide variations occurred in both regions, and that *I. Blancoi* must be reduced. Hallier has recognized it as American, but apparently without definite identification.

The synonymy as regards Philippine botany, is as follows:

IPOMOEA TRILOBA L. Sp. Pl. 161. 1753.

Convolvulus dentatus Blanco, Fl. Filip. 89. 1837; ed. 2. 66. 1845; ed. 3. **1**: 123. 1877; Walp. Linnaea **16**: Litt.-ber. 15. 1842. Not *C. dentatus* Vahl, Symb. Bot. **3**: 25. 1794.

I. Blancoi Choisy in DC. Prodr. **9**: 389. 1845; Miq. Fl. Ind. Bat. **2**: 619. 1857; F.-Vill. Noviss. App. Fl. Philipp. 142. 1883; Merr. Bur. Govt. Lab. Publ. **6**: 26. 1904; Merr. *loc. cit.* **27**: 63. 1905. Merr. Philipp. Jour. Sci. **1**: Suppl. 119. 1906.

I. commutata Naves in Fl. Filip. ed. 3. *pl. 31.* 1877; F.-Vill. Noviss. App. Fl. Philipp. 142. 1883. Not *I. commutata* Roem. & Schult. Syst. **4**: 228. 1819.

I. Batatas Usteri, Viertel. Naturf. Ges. Zürich **50**: 122. 1905. Not *I. Batatas* Poir. Encycl. **6**: 14. 1804.

Since, in Asia, this species seems to be confined to the Philippines, there can be no doubt that the original home is in America. But in Blanco's time it was already very common in the former region, so that it must have been introduced at an early date. It is now known there from several collections, those represented in the herbarium of the New York Botanical Garden being:

LUZON: Bauang, Province of Union, *Elmer 5607, 5726;* Manila, *Merrill 380, 638;* Pasig, *Usteri 564;* Los Baños, Province of Laguna, *Williams 2025, Elmer 8271.*

MINDORO: Pola, *Merrill 2450.*

In tropical America its range is rather wide, extending from Arizona and southern Florida through Mexico and the West Indies to Brazil.

C. B. ROBINSON.

NEW YORK BOTANICAL GARDEN.

A TILIA FROM THE NEW JERSEY PLEISTOCENE. — In the Flora of the Amboy Clays, Professor Newberry described a single imperfect leaf from Fish House, N. J., under the name of *Tiliaephyllum dubium*, remarking that it was very distinct from any other plant yet found in the Amboy Clays and that it resembled some leaves of the basswood, such as could be collected in almost any forest.

In the Annual Report of the State Geologist of New Jersey for 1896, the year that Newberry's monograph was finally issued, Mr. Lewis Woolman discusses in great detail the stratigraphy of the Fish House clays and their fossils, conclusively showing that the dark clays at Fish House are of Pleistocene age and not Cretaceous, as they had been regarded by Lea, Whitfield, Uhler, Newberry, and others. However, the Cretaceous is directly beneath these Pleistocene clays, and at the present time the floor of the pit consists of a somewhat indurated layer forming the contact with what is now called the Magothy Formation of Upper Cretaceous age, but which in Newberry's day was not differentiated from the Amboy Clays or Raritan Formation. Since the lighter Cretaceous clays underlie the dark Pleistocene clays at this point it was not possible for Woolman to determine from which bed the basswood leaf had come, as no additional specimens were found by him, the presumption being, however, that it came from the Pleistocene.

During the past year or two the writer has visited this most interesting locality as occasion has offered, each time making a careful search for plant fossils. It cannot be said that such search proved very successful. A fragmentary maple leaf (*Acer*) was collected at one point, and the clay was found to contain in places a large number of seeds, of which only the gum (*Nyssa*) has thus far been definitely recognized. Fortunately, however,

several imperfect specimens of Newberry's leaf were found, which were characteristic enough to prove that it had come originally from the Pleistocene and is not a member of the Cretaceous flora.

The recognizable plant remains are contained in an interbedded stratum of very compact clay, which is considerably lighter in color than the bulk of the clay and dries to a buff-drab color. The horizon is the same as that carrying the abundant Unios and Anodontas for which the locality is famous. The largest fragment of a *Tilia* leaf is 12 cm. long and 6.5 cm. wide and lacks the tip and a large part of the margin. Together with the shell of a huge *Anodonta*, or freshwater clam, 15 cm. by 9.5 cm., it forms a cleavage plane in the hard clay, one side of the leaf being concealed by the ventral margin of the clam shell.

It seems desirable that this leaf shall be transferred to the modern genus, and while it undoubtedly represents a still existing species, either *Tilia americana* L. or *Tilia heterophylla* Vent., it has not been possible satisfactorily to determine which, so that Newberry's specific name may stand, at least for the present. This will give us the following as the correct citation for this species:

Tilia dubia (Newb.)

Tiliaephyllum dubium Newb. Fl. Amboy Clays, 109. *pl. 15. f. 5.* 1896. Woolman, Ann. Rep. State Geol. N. J. **1896**: 212. 1897.

EDWARD W. BERRY.

BALTIMORE, MD.

REVIEWS

Henshaw's Mountain Wild Flowers of America*

This beautifully illustrated book will prove of great interest and usefulness to those who contemplate spending a summer vacation in the higher mountainous regions of North America. What the full-page illustrations of mountain flowers do not supply, when it is desired to identify some interesting alpine plant, the brief, but terse, descriptions will furnish. As the book is intended for the general public, the plants are not arranged scientifi-

* Henshaw, Julia W. Mountain Wild Flowers of America. Pp. i-xxi + 1-384. Pl. 1-99. Ginn & Co., Boston. 1906.

cally, but are grouped together by the color of their flowers. The white to green flowers form one section of the arrangement, the pink to red another, while the blue to purple flowers, yellow to orange flowers, shrubs and miscellaneous plants, form other sections of the book, which is provided with useful indexes of the scientific and common English names.

JOHN W. HARSHBERGER.

PROCEEDINGS OF THE CLUB

FEBRUARY 27, 1907

The Club was called to order at 3:30 P. M. at the museum building of the New York Botanical Garden, with Dr. William A. Murrill in the chair. Twenty-one persons were present.

The names of Dr. Ernst A. Bessey, Subtropical Laboratory, Miami, Fla., and Dr. William Mansfield, College of Pharmacy, N. Y. City, were presented for membership.

Dr. Herbert M. Richards, chairman of the committee appointed to arrange for the reception given on December 26, 1906, to botanists in attendance upon the scientific meetings of Convocation Week, presented a report. The report was accepted and ordered placed on file, and the committee was discharged.

Resignations were received from Mr. S. Mendelson Meehan, Germantown, Pa., and Miss Dorothy A. Young, 38 Park Ave., Passaic, N. J. The death of Mr. Walter S. Logan, which occurred on July 19, 1906, was reported.

On motion the secretary cast the ballot of the club, electing Dr. Bessey and Dr. Mansfield to membership.

The following scientific program was presented:

"Tubular Glands in the Corn Embryo," by C. Stuart Gager.

The literature dealing with the transformation of starch to sugar in the corn grain during germination was first briefly reviewed, and its bearing on the structural anomaly subsequently described was pointed out. This anomaly consisted of invaginations of the glandular epithelium of the scutellum into the tissue of the latter, in such a way as to form true glands of the tubular and subracemose type.

The significance of these glands, as in harmony with the theory that the scutellar epithelium is principally an organ of secretion, was also indicated. The paper was illustrated by microscopic preparations and photomicrographs, and will be published in full in the *Bulletin* of the Club.

A brief discussion followed.

"Explorations in southern Florida," by John K. Small.

The exploration was confined to the larger group of islands lying between Miami and camps Longview and Jackson, and to a wholly unexplored section of the everglades lying between the present terminus of the Florida East Coast Railway and Key Largo, including a portion of Cross Key. This latter island, together with a parallel and almost similar formation, constitutes the only natural and approximately complete land-connection between the Florida Keys and the mainland of the peninsula. The chain of everglade keys is a miniature of the Florida Keys, both in its crescent shape and its flora, and also of the West Indies in the character of its vegetation. It is surrounded by the everglades, except where the upper islands touch Biscayne Bay at points from Miami to Cutler. Before these islands were elevated to their present altitude, they were probably surrounded by a shallow sea, just as the Florida Keys are at the present time. This being the case, the tropical American flora now inhabiting them may easily be accounted for. After sufficient elevation had taken place, the surrounding sea was transformed into the vast spring now known as the everglades. Conditions becoming favorable, the plants of the flora of northern peninsular Florida advanced southward and naturally took complete possession of the area that was formerly the sea, thus surrounding and isolating the wholly different flora of the islands. In fact, the two floras are so sharply delimited that one can often stand with one foot on plants characteristic of the high northern regions and the other on plants restricted to the tropics. It is not an uncommon experience to see colonies of plants common in Canada, such as the arrow-arum (*Peltandra*), the lizard's tail (*Saururus*), and the ground-nut (*Apios*), growing side by side with tropical palms, cycads, orchids, and bromeliads.

The total area of these islands is perhaps about one hundred and fifty square miles. Those that have been explored have yielded between five and six hundred species of native flowering plants, surely a very large number considering the fact that the solid rock is exposed everywhere and that soil in the ordinary sense of the word does not occur there. The close relationship of this flora to that of the West Indies is now established by the fact that considerably more than one half of the species found on the islands south of Miami are also native in Cuba and the Bahamas.

Since the publication of Dr. Small's last report on exploration in southern Florida, and a subsequently printed paper on the species added to the flora of that state, he has secured over fifty more species not before known to grow on the North American mainland. Eight or ten of these are complete novelties, inasmuch as they are not yet described. Noteworthy among the recent collections, which make an aggregate of 3,200 specimens, are seven specimens not previously included in the tree flora of the United States.

After an interesting discussion of Dr. Small's paper the Club adjourned at five o'clock.

C. Stuart Gager,
Secretary.

March 12, 1907

The Club met at the American Museum of Natural History at 8:15 P. M., with President Rusby in the chair. Ten persons were present.

The reading and approval of the minutes for February 27, 1907, was followed by the presentation of the name of Mrs. Samuel Weiss, Depot Lane, Washington Heights, N. Y. City, for membership.

The resignation of Mr. H. M. Stephens was read and accepted. On motion the secretary cast the ballot of the Club electing Mrs. Weiss to membership.

The following scientific program was presented:

"Remarks on Regeneration," by Miss Elsie M. Kupfer.

The various meanings which have been assigned to the word regeneration were first discussed. It was brought out that, while

some writers would limit the term to the restoration of embryonic tissue in root and shoot, others would include within the scope of the process merely the development of buds present before injury. It seemed best to take the middle ground and consider as a regeneration any organ formed anew after injury or loss.

The different plant organs were used as cuttings and their behavior examined when buds were absent. On the roots which formed shoots it was found that these were not confined to the upper (basal) surface, but could appear from the apical as well, or from the middle of the root. The roots of less than half of the species used formed shoots, while all produced roots not always as true regenerations, but as outgrowths from the uninjured cambium. Budless stems proved able to root with ease but were unable to replace the buds which had been cut out. Such parts continued growing for fifteen months without undergoing any tissue change, while a part on which a single bud was left established secondary vascular strands between the bud and the new roots. The pseudobulb of an orchid proved able to regenerate roots and a shoot from the base, and in a conifer the apparent "restoration" of a single root on the seedling and in an older stem-part was described. Of eighty-two species of leaves used in experimentation only two new ones were found which produced a shoot, though the large majority formed roots. Modified leaves of various types, such as phyllodes and bulb-scales, were also found to be able to root. Regeneration was likewise reported in the inflorescence of *Dudleya californica* and *Ruellia rosea*, in the fruits of *Phaseolus vulgaris* and *P. lunatus*, and finally in the "head" of the alga *Penicillus capitatus*.

An extended discussion followed.

Owing to the lateness of the hour, Dr. Rusby did not present his paper on "Field Observations of the Past Year," but exhibited a few interesting plants collected at Oscoda, Michigan.

Dr. Southwick exhibited several interesting specimens of the seeds of *Ricinus*.

The meeting adjourned at ten o'clock.

C. Stuart Gager,
Secretary.

NEWS ITEMS

Professor Francis E. Lloyd, of the Desert Botanical Laboratory, will conduct a botanical course next July in the summer school of Harvard University.

At Barnard College, Columbia University, Dr. Tracy E, Hazen has been promoted from tutor to instructor in botany. and Miss Marion E. Latham from assistant to tutor in botany.

Dr. D. T. MacDougal, director of botanical research in the Carnegie Institution of Washington, has recently made an expedition to the Salton Sea in southern California and to adjacent parts of the delta of the Colorado River in Baja California.

Dr. Tracy E. Hazen of Barnard College gave a lecture on "The Evolution of the Green Algae" at the Brooklyn Institute of Arts and Sciences on March 20. The lecture was repeated on April 3 before the Barnard Botanical Club.

Mr. William R. Maxon, of the United States National Museum, left Washington on March 24, intending to spend two months in making botanical collections in eastern Cuba, in coöperation with a party of topographical engineers of the United States Army.

It is announced in *Science* that Dr. Bradley M. Davis has resigned his connection with the Marine Biological Laboratory at Woods Hole, Mass., and that Dr. George T. Moore of West Chester, Pa., will be in charge of the botanical department of that institution during the present summer.

Miss Mary Perle Anderson, instructor in botany in Mt. Holyoke College, who has been pursuing special studies during the present year in Columbia University, has been appointed critic teacher of biology and nature-study in Teachers College of Columbia University. Miss Anderson will spend the coming summer in Europe, where she will visit several of the larger herbaria and botanical gardens.

Busts of ten American men of science were unveiled at the American Museum of Natural History, with appropriate exercises, on December 29, the ten chosen to be thus commemorated being Franklin, von Humboldt, Audubon, Torrey, Henry, Agas-

siz, Dana, Baird, Leidy, and Cope. The brief memorial addresses delivered on that occasion and photographs of the busts are published in the April number of *The Popular Science Monthly*. Dr. Nathaniel L. Britton gave the address on John Torrey.

The New York Academy of Sciences will commemorate on May 23, the two hundredth anniversary of the birth of Linnaeus. In the morning of that day there will be addresses at the American Museum of Natural History and an exhibition of animals, minerals, and rocks known at the time of Linnaeus; in the afternoon, in Bronx Park, there will be addresses and exhibits at the Botanical Garden and the Zoological Park and the dedication of the Linnaean Bridge; in the evening, there will be simultaneous exercises at the Museum of the Brooklyn Institute and at the New York Aquarium.

Dr. Melville T. Cook, recently in charge of the department of plant pathology in the Estación Central Agronómica de Cuba, and for the past few months engaged in research at the New York Botanical Garden, has been appointed professor of botany in Delaware College and plant pathologist in the Delaware Agricultural Experiment Station. Dr. Cook's work, which began April 1, will be chiefly research, under the provisions of the Adams Act. His special work for the present will be on the "crown gall" of the cultivated species of *Rubus*, which has caused serious losses to the fruit-growers of Delaware.

Dr. and Mrs. N. L. Britton and Dr. C. F. Millspaugh returned during the last week in March from a successful botanical survey of some of the outer islands of the Bahaman archipelago. Visits were made to Eleuthera, Little San Salvador, Cat, Conception, Watlings and Long Islands. This was the fourth in the series of expeditions made by Dr. Britton to the Bahamas, and the third by Dr. Millspaugh. The large amount of material thus brought together, supplemented by collections made for the New York Botanical Garden by Nash and Taylor and by Brace, and the earlier collections of the Northrops, of Hitchcock, and of Coker, will serve as a tolerably satisfactory basis for a descriptive treatment of the interesting flora of these islands.

Dr. Otto Kuntze died suddenly at San Remo, Italy, on January 28. He was in his sixty-fourth year, having been born in Leipsic, June 23, 1843. Dr. Kuntze was a pharmacist in early manhood and is said to have acquired a comfortable fortune by the age of thirty through the manufacture of ethereal oils. Meanwhile, he had developed much interest in systematic botany and as early as 1867 published a "Taschen-Flora von Leipzig." In 1874–'76, he made a journey around the world for botanical observation and collecting, and on his return studied in Leipsic and Berlin and in 1878 received the degree of doctor of philosophy from the University of Freiburg, his dissertation being a "Monographie der Gattung Cinchona L." He afterwards published an account of his journey, a monograph of the genus *Clematis*, and a revision of the genus *Sargassum*. Subsequently he made other extensive botanical journeys, the two most important being to South America in 1891–'92 and to southern and eastern Africa in 1894. In determining the plants collected on these expeditions, Kuntze became impressed with the wide diversities of usage in the matter of plant-nomenclature and took strong ground in favor of the priority principle, embodying his views in his "Revisio Generum Plantarum," which appeared in three volumes in 1891–'98. This work, which involved a vast amount of bibliographical research, was based on the so-called "Paris Code" of 1867, to which, by certain amendments, he attempted to give more definiteness and precision. Kuntze's "Revisio" and his numerous subsidiary papers on nomenclatural questions have had a wide influence with botanical systematists, though not wholly in the direction intended or anticipated by their author. His intolerance of opposing views and his imperfect command of some of the foreign languages in which his polemics were published, contributed to his peculiar distinction in the botanical world, but detracted somewhat from the serious consideration to which his opinions were entitled. Dr. Kuntze had been for several years on the active membership list of the Torrey Botanical Club. His last visit to the United States was in the summer of 1904.

Vol. 7. No. 5.

TORREYA

May, 1907

THE RATE AND PERIOD OF GROWTH OF POLYPORUS LUCIDUS *

By C. W. Edgerton

Very little has been done by botanists in regard to rate and period of growth among members of the higher groups of fungi. Miss Douglas (2) in 1906 studied the growth of *Panaeolus retirugis*, one of the agarics, under greenhouse conditions. Schmitz (4) in 1842 worked on a number of forms, both agarics and *Polypori*. Fries (3) had made the statement that fungi grow from the center outwards. Schmitz took exception to this, and by marking spaces of known size on such forms as *Polystictus hirsutus* and others, he was able to show that the growth was in the periphery and not the center. Beyond these, the literature relating to the growth of the higher fungi is very scanty.

It was to find out as much as possible concerning the phenomena of growth in these forms, especially the woody members, that this study was undertaken. Little was known definitely concerning the rate of growth, the growing period, the effects of external conditions, or for that matter even the actual position of the growing area. In some perennial forms, such as *Fomes fomentarius* and others in which a layer is added each year, it is an easy matter to obtain the yearly increase. But in these, the growth is so slow that it is impossible to obtain reliable data on the other points just mentioned. A form growing in abundance around Ithaca, N. Y., that seemed to be very well adapted for such a study was the so-called *Polyporus lucidus* (Leys.) Fr.† Its

* Contribution from the Department of Botany, Cornell University, No. 120.

† This is the name by which the fungus is commonly known in this country. However it has recently been described by Dr. Murrill in Bull. Torrey Club **29**: 601. 1902, as a new species, *Ganoderma Tsugae*.

[No. 4, Vol. 7, of TORREYA, comprising pages 69–88, was issued April 15, 1907.]

growth is extremely rapid for one of these firm fungi, and consequently any change of any kind in growth that might occur would be easily noticed. The fungus, as was mentioned above, is a common one in the vicinity of Ithaca, sometimes found in large numbers in damp woods and gorges on dead stumps and trunks of hemlocks. It is one of the stalked *Polypori*, characterized by the red varnished appearance of the stalk and pileus. At maturity, which is always in the first year, it being an annual at least in the north, it becomes very hard and brittle.

Growth in this form begins early in the spring, it being one of the first to start. The fungus breaks through the outer layers of wood and bark and makes its appearance as a soft white round button or ball of mycelium some time in May or early June, though the date is somewhat dependent on external conditions. This button is at first nearly spherical, perhaps a centimeter or less in diameter. As to color, it is perfectly white, being as yet without a trace of the red varnish which characterizes its later stages. It is not until the plant has reached a length of one and a half to two centimeters that it begins to take on the varnished character. The varnish forms on the older parts of the plant, the young growing part always remaining white. This is characteristic of the plant through its entire development. It has a white zone of growing tissue at the margin, while the basal older parts are covered with the varnish. After a part assumes this condition, it is incapable of further growth. A number of buttons were noticed, which, probably on account of unfavorable weather conditions, had ceased to grow and had become covered with the varnish. Although these were not more than one centimeter in diameter, they remained unchanged the whole season.

The growing period is confined to the spring and early summer months. It rarely extends to the first of August, though perhaps under favorable conditions it may grow for a longer period, and generally stops by the middle of July. The growth takes place at the extreme edge of the fungus. It is the result of adding more tissue to the outside, or in other words it is exogenous. After a part or zone is once formed, it is incapable of further

growth. No matter how close to the margin a mark was placed, all the growth was outside of it. For instance, spaces one millimeter apart were marked on the pileus with India ink. On examination a few days later, it was seen that all the growth had taken place in the outer millimeter. The other spaces had not increased in size.

This manner of growth is unusual in other families of the plant kingdom. In all higher plants, the zone of growth is located a little distance back from the apex of the growing point. Also in the agarics among the fungi, we find a method similar to the higher plants in the elongation of the stipe. According to Miss Douglas and also Schmitz, the most rapid growth is in a zone slightly below the apex of the stem, and from this zone, growth is less marked as the base of the stem is approached. But the stems of the agaric and of the polypore seem to be different and are not comparable from the standpoint of growth. In the agaric, the hymenium is formed and the growth of the stem merely raises this up above the ground where the wind may catch the falling spores. In *Polyporus lucidus*, the stem is the first part formed and is perfectly developed before the hymenial surface starts to form under the pileus. If we are to compare the growth in the two forms, we should compare it in the young pilei in both cases before and while the hymenium is forming. In the agaric, this will exclude the elongation of the stipe, while in the *Polyporus*, it will include nearly the whole development of the plant. Whether the growth and development of any of the agarics is similar to the method we have seen in *Polyporus lucidus* is a question. It is surely not in all cases for Atkinson (1) has shown that in *Agaricus campestris*, there is an endogenous development in the pileus in the early stages. The latter is very different from the exogenous development in *Polyporus lucidus*. Other forms of agarics as *Collybia* and *Cantherellus* that have an exogenous development of the hymenium may have a growth similar to *Polyporus lucidus*, but this can be answered only by observation and measurement.

Among the external conditions which may affect growth are temperature, moisture, and nourishment. Temperature has a

decided influence. A long cold period will cause almost a total stopping of growth, though the fungus responds very quickly again to warmth. The effect of temperature will be very clearly shown in FIGURE I. Curve B represents the average growth of twenty fungi from June 7 to June 24, while curve A shows the average daily temperature for the same period, the figures for this being obtained from the local weather-bureau office. As will be seen, the temperature curve contains a decided depression from June 10 to June 13, showing a cold period. The average temperature ranged from 49° to 56° F. during this period, while during the rest of the time it was between 65° and 76°. The effects of this cold period are clearly shown in the lower curve. Growth

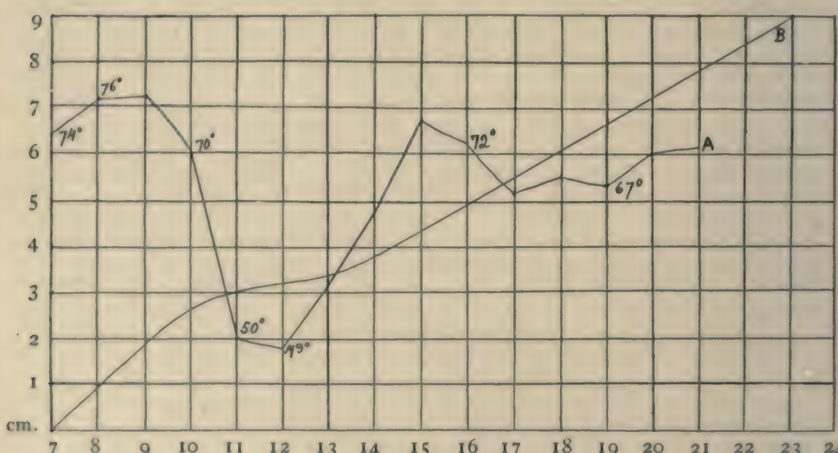

FIGURE I. Curve A represents the average daily temperature from June 7 to June 21, 1906, showing a cold period from June 10 to June 13.

Curve B represents the average daily growth of twenty specimens of *Polyporus lucidus* during the same period. The effect of temperature on growth is shown.

was almost at a standstill. Some individual fungi did go through this period of three days without a measurable increase in growth.

As to moisture and nourishment, we are unable to form an accurate conception of their influence. The fungus grows on logs and stumps which hold a large amount of moisture for some time. It is hardly probable that the lack of moisture is a factor until the logs begin to dry out in the summer. It may then, and

probably does, have something to do with the stopping of growth at that time. The question of nourishment was not studied, it being impossible to determine the variation in nourishment if there was any.

From the button stage until the plant almost reaches maturity, growth is at a very even rate, as will be seen in the curve in FIGURE 2. Of course the individual fungi vary some, but the average of a number gives almost a straight line. There is an evident depression in the curve, but this is not due to a normal decrease in growth at this period, but due to the period of low temperature above discussed. Of course in making the curve, it was neces-

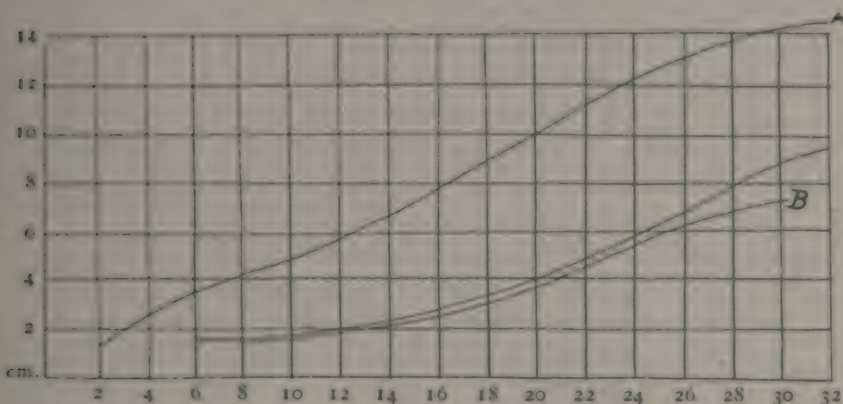

FIGURE 2. A represents the average daily growth of a number of individuals from the button stage to maturity, during a period of thirty two days. Growth is figured in centimeters.

B represents the increase in length of the white area underneath the pileus, during the same period.

C represents the lateral growth of the pileus during the same period.

sary to start all the fungi of a certain size at a certain place on the curve, for instance all the fungi about 1.2 cm. in length were started at 2 on the curve, whether they began to develop at the same time or three weeks apart. From this point, the curve was plotted, the average daily increment of growth being used for the ordinates and the number of days for the abscissæ. In all of the fungi measured, the cold period came sometime between the seventh and seventeenth days of their development. And as will

be seen, that period shows the depression in the curve. Measurements were not taken on the young buttons until they were about two days old. A number at this age averaged 1.2 cm. in length.

The average growth of this fungus is about one half-centimeter per day. Individual plants sometimes grow as much as a centimeter per day, but this is not common. Compared to other woody forms, a half-centimeter per day is very rapid growth. Most of these are perennial, and the total yearly growth is only a few centimeters at the most. Probably the fastest growing perennial form that we have is the so-called "*Polyporus applanatus*." * Yet from measurements taken during the summer, the fastest growth for any individual was 1.5 mm. per day, while the average growth for a number during the month of August, that being the month in which growth is the most rapid, was 0.7 mm. per day. This is only one seventh as fast as that of *Polyporus lucidus*. Compared to slower growing forms as *Fomes fomentarius* and *Fomes pinicola*, the difference must be much greater.

This extremely rapid growth means a large amount of added tissue each day. The fungus is about one half-centimeter thick at the apex. Taking one that is only twenty-five centimeters in length, we would have added a daily increment of twenty to twenty-five cubic centimeters. This must mean a very rapid utilization and transport of the food materials by the fungus.

As the plant approaches maturity, growth gradually ceases and for the last week or ten days it is very slow. External factors seem to be the cause of the maturing of the plant. For the curve last mentioned, plants were used that came to maturity at a length of about fourteen to fifteen centimeters. If plants had been used that matured at twenty-five centimeters, the only difference in the curve would have been the lengthening of the straight part of it until a height of about twenty-three or twenty-four was reached. The plant seems to be able to keep growing at about the same rate as long as conditions are right. But when conditions are not right, as for instance, lack of moisture or nourishment, the plant takes on the mature condition.

* *Fomes megaloma* Lév., or according to Murrill in Bull. Torrey Club **30**: 300. 1903, *Elfvingia megaloma* (Lév.) Murrill.

This is also shown by the fact that quite generally all the plants on a single stump, both large and small, will come to maturity at the same time.

As we have noticed before, *Polyporus lucidus* is one of the stalked *Polypori*, but the length of the stalk is variable with the different plants, some being nearly sessile, while others have very long stalks. The stalk is the first part of the plant to develop. From the button stage, the plant continues to add on more tissue exogenously, all of which becomes covered with the red varnish except about one to two centimeters of the terminal margin, which remains white. However, after the plant has been growing for seven to fifteen days, it will be noticed that the white part on the under side of the plant is becoming longer. It does not become varnished over as fast as it is formed. Or, in other words, the pileus has commenced to form. This is rather a slow process at first, as the cap does not seem to be started all at once, but the varnishing process on the under side gradually slackens up. Consequently as the plant develops, there is left a greater white area beneath. This white area is used in the curve representing the development of the pileus. This area does not all develop into pileus, for that of the first few days of development becomes part of the stalk. It is impossible to tell how much of this white area will be stalk and how much pileus until several days after it begins to increase in size. Then the boundaries of the cap or the hymenial surface become marked out, and consequently thereafter, the increase of the cap equals that of the whole plant. The formation of the pileus does not begin at the same time with all plants, so it is a difficult matter to show its development with a curve. But this was attempted by selecting a number of plants having about the same length of stalk, about six centimeters, and plotting the average increase of the white area on the under side of the pileus. This shows that in plants with stalks of this size, the stalk reaches its complete development between the twelfth and eighteenth days, and also that the boundary of the cap is established between these dates. Of course with a longer or shorter stalk this would vary somewhat. But the curve shows the most important fact, that the formation of the pileus is a gradual process.

About the time the pileus begins to form the plant begins to widen out. Up to this time, the increase by growth had been almost entirely in length. In the increase in width, we find considerable variation, more so than in the increase in length. But the average of a number of plants shows that the lateral growth is but very little faster than the terminal growth. In the increase in width, there are of course two growing zones, both sides adding an equal amount of tissue. Consequently the growth on one side is but slightly over one half what it is on the terminal margin. As a result, the hymenial surface of the mature plant is generally but slightly wider than it is long. Of course, we sometimes find very wide plants but these are quite often due to the fusing together of several small caps that started from the same stalk. Curve C in Figure 2 is plotted showing the increase in width, the values being obtained from the average growth of a number of individuals. The curve brings out the facts above mentioned. It is strikingly similar to the one showing increase in length of the pileus. Yet we have two sides increasing in width to only one increasing in length.

In conclusion, we will merely enumerate the results already mentioned: (1) *Polyporus lucidus* is a fast growing member of the Polyporaceae, growth averaging about one half-centimeter per day for the growing period. (2) Growth is exogenous, taking place entirely at the edge of the plant and continuing as long as conditions are favorable. (3) The change in the development from stalk to pileus is a gradual process. (4) The average lateral growth is but slightly more than the terminal growth.

In closing, I wish to acknowledge my indebtedness to Professor Atkinson, at whose suggestion this work was undertaken and carried out.

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Cornell University,
Ithaca, New York.

OUR EASTERN SHADWOODS

By W. H. Blanchard

The genus *Amelanchier* is interesting to many people, and botanists are but a small part of them. The flowers are early and showy and the fruit is early and quite edible. Throughout most parts of the north temperate zone some form of it occurs, often more than one, and all are much alike. They may be treated as forms of a single species as Michaux, and Torrey and Gray treated our North American forms.

All of the forms of this genus readily and probably naturally fall into two classes. The type of one class is our *A. canadensis* (L.) Medic. This class is characterized by serrate acuminate leaves varying from cordate to cuneate, and naked-topped fruit. It includes *A. asiatica*, *A. oblongifolia* (T. & G.) Roem. and *A. oligocarpa* (Michx.) Roem. The last-named may be made a subclass.

The type of the other class is the European *A. rotundifolia* (Lamarck) Dum.-Cours, synonyms of which are *A. vulgaris*, *A. ovalis* Medic. (1793) and *A. Amelanchier*. This second class is characterized by oblong or rounded leaves, generally dentate and often thick, and woolly-topped fruit. It includes Michaux's *Mespilus canadensis* var. *rotundifolia*, Lamarck's *Crataegus spicata*, Spach's *A. ovalis*, and Nuttall's *A. alnifolia* and the large number of species lately segregated from *A. alnifolia* in the "Far West." All of the characters of these two classes though pretty constant are not always so.

To decide on the names by which the forms shall be called is not a simple matter. They have been described as species and varieties under several generic names, the best known being *Mespilus*, *Crataegus*, *Pyrus*, *Aronia*, and *Amelanchier*, and have often

been transferred from one genus to another. At least forty different specific and varietal names had been applied to them before 1850. With four sets of rules, Vienna, Kew, Rochester, and Philadelphia, and at least as many different interpretations of them, uniformity of names can hardly be expected at present for such varying and poorly studied plants.

There is no complete index to the literature on this genus. Many names are omitted in the Index Kewensis, and even when Watson's Bibliographical Index, Roemer's Synopses Monographicae and Sargent's Silva are also consulted, important references are wanting.

A. CANADENSIS (L.) Medic. There seems to be good reason to adopt this name for our largest form. Linnaeus named it *Mespilus canadensis*, or rather adopted the name. Medicus put it into his genus *Amelanchier* in 1793. But it has another name. When the son of Linnaeus transferred his father's *Mespilus canadensis* to the genus *Pyrus*, for some reason not apparent he gave it a new specific name, *Botryapium*, which De Candolle retained when he transferred it to *Amelanchier*, in 1825, so that *A. Botryapium* is a synonym for this species and is generally used in English nurseries. Torrey and Gray very ingeniously united both names, calling it *A. canadensis* var. *Botryapium*. Some of its other synonyms are quite suggestive of its appearance, such as *arborea*, *racemosa*, and *cordata*. Michaux's specimen of the latter, *M. canadensis* var. *cordata*, as he called it, is very typical; a photograph of it is now in the Gray Herbarium.

A. INTERMEDIA Spach. The smaller forms of *A. canadensis*, generally called "oblongifolia," become under the Rochester Code *A. obovalis* (Michx.) Ashe. The photograph in the Gray Herbarium of Michaux's specimen seems to be typical. If we regard this form or rather these forms as a variety, the name will be *A. canadensis* var. *obovalis*. But if we regard it as a species there seems to be no excuse under the other three rules for disregarding the oldest available specific name which it has received. Spach named it as above in 1834, or four years before Torrey and Gray used the varietal name *oblongifolia*, which Roemer made specific in 1847. Spach gave it a good character-

ization and placed it in his book and described it as intermediate between *A. canadensis* and a species of American *Amelanchier* which he called "*A. ovalis* (*Crataegus spicata* Lam.)."

A dwarf form of this class grows on the rocks at Bellows Falls, Vt., between the two railroad bridges. It is so interesting that it is proposed here as a new species:

Amelanchier saxatilis sp. nov. Small, spreading, partly prostrate shrubs, 1 to 3 feet high, irregularly and abundantly branched; branches slender, twigs very slender; breaking buds slim, rather woolly, scales narrow; bracts rose-color. Leaves very woolly on the lower side when young, glabrous when full-grown, oval, rounded at the base, points short and broad, finely serrate, 1.5 in. long by 1 in. wide. Flowers early, abundant, rather small, well proportioned, 0.75 in. broad, very white, in very numerous, spreading, slender racemes; peduncle, pedicels, and calyx densely woolly. Petals very narrow, three times as long as wide. Fruit small, ripening early, in slender racemes, top of pome glabrous.

Type in the herbarium of W. H. Blanchard. This form has much of the habit of the sand cherry, *Prunus pumila* L. and when in flower would be taken for it at a little distance. This delicate species is not the dwarf form of *A. intermedia* Spach, which grows on the rocks near the coast, often hardly a foot high, erect and bearing fruit.

A. OLIGOCARPA (Michx.) Roem. The mountain form with few flowers has generally had but one name, though sometimes it has been called *A. sanguinea*, which name belongs to another species. It is quite variable and has been little studied. Dr. Britton has recently segregated from it

A. ARGUTA Nutt., which is perhaps more correctly *A. arguta* Britton, the name, it appears, having been given first to an herbarium specimen by Nuttall but first published in Britton's Manual, ed. 2, p. 1066, without citation of a type or any definite reference to the source of the name. The species, however is more fully described in TORREYA **5**: 107. Je 1905, by Mr. Eggleston, who indicates the materials from which the original description was drawn.

The forms of the second class which have been called *sanguinea*,

spicata, *ovalis*, and *rotundifolia* may now be considered. The last two names are not available, as they were early used for the European species. There appear to be two forms of this second class in eastern North America. The first is a northern form mostly confined to Canada and the high or northern sections of the United States. It has large and nearly round leaves, generally coarsely toothed, often approaching *A. alnifolia* in that respect, has white flowers, and is often quite large or a small tree. The second form is more southern, more dwarf, with oval leaves, late, often yellow, flowers, and late-ripening fruit.

The first form seems to be the one named *Crataegus spicata* by Lamarck, which he says is supposed to have been brought from Canada. He saw the plant in cultivation. The combination *Amelanchier spicata* was first made by Koch in 1869, but he described *A. intermedia* (*A. oblongifolia*). However, as he expressly and conspicuously cites Lamarck's *Crataegus spicata*, his name must be considered as applying also to Lamarck's plant and indeed the latter may be fairly interpreted as the type of the binomial *Amelanchier spicata*. In 1874 Decaisne made the combination again and he also described *A. intermedia*. Again in 1893 Koehne made the combination in his Dendrology, but he has not described Lamarck's plant. The name is still available and cannot be dropped, so it is taken up again :

A. SPICATA (Lamarck) Koch, Dendrologie **1** : 182. 1869. (Excluding description.)

Described by Lamarck, Encyclo. **1**: 84. 1784. He says it is two or three times as high as the European species, leaves rounded, dentate, nearly as wide as long, 1.5 inches in diameter. Michaux in his Flora of North America **1**: 291. 1803, described it under the name of *Mespilus canadensis* var. *rotundifolia* : "Arboresens ; foliis suborbiculato-ovalibus, utrinque rotundatis." Habitat, "in Canada." Tracings in the Gray Herbarium of two leaves of Michaux's specimen are evidently quite different from the specimens Koehne has sent out to illustrate his book. Another name which seems to have been given to this form is *A. sanguinea* (Pursh) De Candolle, 1825, and under any rules which would preclude the use of a combination a second time

and would, in a case like *A. spicata* (Lamarck) Koch, restrict a new binomial to a plant to which an older specific name has been mistakenly transferred, *A. sanguinea* would have precedence over all others.

The second form has been known as *A. ovalis* and *A. spicata*, the former an unavailable name, and is abundant in many parts of New England and probably extends much farther west. It may be described as

Amelanchier erecta sp. nov. A slender erect shrub, 4 to 12 feet high, sparingly branched, growing in colonies and making a thick hedge. Twigs very erect, stocky. Buds very woolly when breaking, bud-scales short; bracts dark-purple, the starting leaves often yellow. Leaves very woolly on the under side when young, glabrous when fully grown, broad-oval, rounded or slightly cordate at the base, point short and broad or wanting, rather coarsely serrate-dentate or often even finely serrate; the leaves on vigorous new wood larger, often very broad, sometimes nearly orbicular. Flowers not large, often having a spread of less than an inch, often light-yellow, in close, stocky racemes, densely woolly. Fruit on erect pedicels in close erect clusters, the calyx-lobes rather short, reflexed-curled, rather small, the top of the pome densely woolly within the calyx lobes. Starts some days later than *A. canadensis* and ripens its fruit several weeks later.

Type in herbarium of W. H. Blanchard.

The fruit seems to drop badly when nearly ripe, and with the depredations of birds ripe fruit is often scarce. Abundant and typical in and around Bellows Falls, Vt., both on rocks and in dry or loamy soil.

The evidence seems to be pretty conclusive that Lamarck's *spicata* is the northern form of Michaux — his *rotundifolia*. Lamarck's description agrees well with Michaux's. He says that the plant he described grew in the Royal Garden and in private grounds and was supposed to be a native of Canada. The close connection of Canada to France until 1763 makes it almost certain that Canada was its home. There is no reason to suppose it came from a more southern region. Koehne evidently tried to include in his *spicata* both the northern and more southern forms, but his description and his specimens apply to the more southern form.

Diverging and intergrading forms are abundant in the genus. Noticeably so is it with the arboreal species, *A. canadensis*. Trees occur whose leaves are pubescent throughout the season. Leafy forms occur whose fruit branches are remarkably leafy, the fruit being entirely hidden. Birds make such onslaughts on the ripe fruit that in order to get it in quantity and perfection it is necessary to study it miles away from the inhabited sections, for birds are rare in such localities.

WESTMINSTER, VT.

SHORTER NOTES

Ribes chihuahuense sp. nov. — Branches smooth, gray. Leaves ovate to suborbicular in outline, the blades 2–2.5 cm. long, dull dark-green above, pale-green beneath, broadly cuneate to subtruncate at the base, 3-lobed, glabrous on both sides, papillose above when young, sparingly ciliate on the margin, the lobes few-toothed, acutish or obtuse, petioles as long as the blades or shorter, pubescent when young; racemes 3–5-flowered, a little longer than the leaves, the axis densely pubescent; flowers sessile or very nearly so, bracts ovate-elliptic, obtuse, ciliate, 5–7 mm. long; hypanthium nearly cylindric, 1 cm. long, sepals oblong, obtuse, 6–7 mm. long; petals ovate-oblong, acute, a little more than half as long as the sepals.

Chihuahua, Mexico, Feb., 1903, *C. A. Purpus, 1061.* Differs from all the United States species by the essentially sessile flowers.

N. L. BRITTON.

FASCIATIONS IN DROSERA, IBERVILLEA, AND CECROPIA. — The fasciated specimen of *Drosera rotundifolia* pictured herewith was found in the propagating houses of the New York Botanical Garen in March, 1907. The flattening affected the stem, resulting in a fasciated rosette, with a growing line 1.4 cm. in length. The literature of teratology seems to contain no instance of fasciation in this genus, while the odd character of the plants makes the appearance of anomalous individuals the object of peculiar interest.

Another fasciation of a curious and rare species is that of a shoot of *Ibervillea Sonorae*. One of the vine-like branches which

spring from the enormous storage tuber measures a little over a centimeter in width. In this case but a single branch is abnormal and the rest of the plant is apparently unaffected.

The fasciation of roots is comparatively infrequent, but Renaudet in a thesis dated Poitiers, 1901, states that it is found oftenest among the aërial roots of tropical species. *Cecropia palmata* produced three fasciated roots in the tropical house of the New York Botanical Garden in 1906. They emerged from the

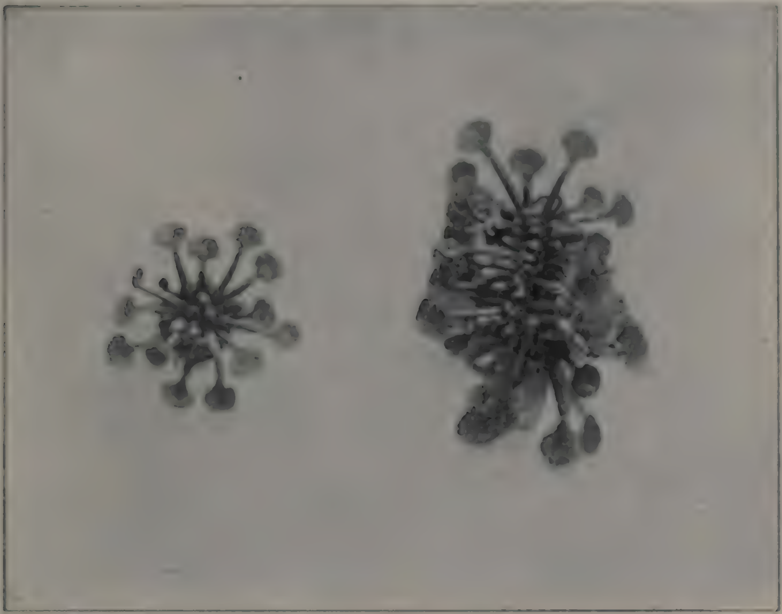

FIGURE 3. A normal and a fasciated plant of *Drosera rotundifolia*.

trunk somewhat over a foot from the ground, began to flatten close to the main axis, and were finally deeply grooved and bifurcated. The largest measured 12 mm. in width and was three-forked. They resembled closely the drawing of a root of *Pothos aurea* by Udo Dammer in Gardener's Chronicle (**26** : 724. 1886), although, perhaps owing to the early development of the fasciation, injuries such as he has described in connection with the fasciation of *Pothos* could not be detected.

ALICE ADELAIDE KNOX.

REVIEWS

Gardner's Cytological Studies in Cyanophyceae *

The many difficult questions as to the minute structure of the blue-green algae have been thoroughly reviewed and carefully studied by Dr. Gardner and his results are clearly set forth in a paper which appeared last November in the University of California Publications. His investigations have been concerned chiefly with fifty-three species representing many genera and most of the families of the Cyanophyceae. With this broad view of the field, there is naturally a better opportunity of reaching just conclusions than in the more common cytological method of studying only a few forms. Dr. Gardner found that with proper treatment everything of essential importance in the cells of these small plants may be seen without making microtome sections and finally came to use the microtome "only to supplement and check results obtained without it." The principal points as to which there has been disagreement among observers involved the existence of nucleus and chromatophores, the structure of the cytoplasm, the structure of the nucleus, if it exists, and its behavior during cell-division. Some of the more interesting results of the present investigation are summarized by Dr. Gardner as follows:

"The cell of the Cyanophyceae contains a nucleus which in some species is sharply delimited from the surrounding cytoplasm, while in others the differentiation is much less marked."

"In all the species studied, with the possible exception of *Synechocystis*, the nucleus divides amitotically, beginning at the periphery and gradually proceeding to the center."

"There is no definitely organized chromatophore, the cytoplasm holding the coloring matters."

"No protoplasmic continuity between the vegetative cells has been demonstrated."

"A new type of nuclear division has been discovered in *Dermocarpa*, in which the nucleus breaks up simultaneously into a large number of daughter nuclei by a process of amitosis."

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*Gardner, Nathaniel Lyon. Cytological Studies in Cyanophyceae. University of California Publications. Botany **2**: 237–296. *pl. 21–26.* 10 N 1906.

"The present investigation reveals in the Cyanophyceae a series of nuclear structures beginning with a very simple form of nucleus scarcely differentiated from the surrounding cytoplasm and dividing by simple direct division. From this we pass by very gradual steps to a highly differentiated form of nucleus which in dividing shows a primitive type of mitosis, and in structure approximates the nucleus of the Chlorophyceae and the higher plants."

"In this group of plants the transmission of hereditary qualities seems to be accomplished with the greatest precision, without the complicated machinery of mitosis. In this connection it may be noted that the lack of sexuality seems in no wise to affect the amount of variation, which is quite the same as in groups where sexual reproduction occurs."

MARSHALL A. HOWE.

PROCEEDINGS OF THE CLUB

MARCH 27, 1907

The Club met at the museum building of the New York Botanical Garden at 3:30 P. M. Thirteen persons were present.

The death of Dr. Otto Kuntze, at San Remo, Italy, on January 28, 1907, was reported, and the resignation of Professor George Macloskie was presented and accepted.

The following scientific program was presented:

"Some Lactarii of Windham County, Vermont," by Miss Gertrude S. Burlingham:

The rugged and wooded character of Vermont makes the region especially favorable for the growth of the fleshy fungi. But the only field work in the state on this group, of which we have published results, is that of Charles C. Frost (1805–1880), who collected in the vicinity of Brattleboro. Frost was a shoemaker in Brattleboro, and is commonly reported to have begun his botanical tramps as an antidote for dyspepsia. In 1875 he coöperated with Tuckerman in a "Catalogue of plants growing without cultivation within thirty miles of Amherst College," and it is probable that most of the fungi listed were collected by Frost in Vermont.

The present collection was made during the past summer in Windham County, Vermont, immediately north of the region explored by Frost, in a belt reaching from Newfane east to Putney Mountain and west to Stratton Mountain. This part of the county varies from 180 to 600 meters in elevation, and is well wooded with balsam, spruce, hemlock, beeches, maples, and birches. In all, thirty-three species of *Lactarii* were found, of which twenty-two are not included in Frost's list. Five of these are new species, and two others are reported from the United States for the first time. Ten additional species are given in Frost's list, making for the state forty-three species, a greater number than has been reported from any other state with the exception of New York. Frost enumerated several new species, but he failed to publish any description of them, and thus unfortunately they cannot be taken into account.

Discussion followed.

"The distribution of Tree-Ferns of the Genus *Cyathea* in the West Indies," by L. M. Underwood:

The Genus *Cyathea* was originally published by Sir J. E. Smith in 1793. *Cyathea arborea*, the common lowland species of the West Indies, is the type of this genus. *Cyathea* is the type of the family Cyatheaceae containing most of the tree-ferns. There are about eleven other genera, only one, *Alsophila*, as large as *Cyathea*, which has some two hundred species about equally divided between the tropics of the Old World and the New. The 104 American species are divided about equally between North and South America. Some of the distributional features are as follows:

1. No species are common to the Old World and the New. This applies equally to all tree-ferns.

2. With two or three exceptions, no species are common to North and South America.

3. As a general rule each species is local in its distribution.

4. *Cyathea arborea*, a lowland species, is the only one common to the Lesser Antilles and all the Greater Antilles.

5. *Cyathea insignis* is common to Cuba and Jamaica (1200 meters).

6. *Cyathea pubescens* is common to Jamaica and Porto Rico. (1200–1500 meters.)

7. *Cyathea Tussacii* is common to Jamaica and Hispaniola. (1200–1500 meters.)

8. *Cyathea muricata* is common to Guadeloupe and Martinique.

9. *Cyathea tenera* is rather widely distributed from Trinidad through the Lesser Antilles.

10. Besides the above are the species endemic in single islands: Cuba, 3; Porto Rico, 1; Jamaica, 9 (three of which are still imperfectly known); Dominica, 1; St. Vincent, 1; Trinidad, 2.

11. All of the well-known endemic species of Jamaica are confined to altitudes above 1000 meters and some of them above 1500 meters.

12. The higher altitudes of Cuba and Hispaniola, whose flora is unknown, are likely to furnish additional species.

Attention was called to morphological and physiological features worthy of investigation as follows:

a. Marked structural differences in shape and arrangement of leaf-scars supposed to be due to differences of nutrition and consequent rapidity of growth.

b. The function of certain gland-like structures at the bases of the leaves in certain species and at the bases of the pinnae in others.

c. The origin of pendent lateral bud-like branches (especially in *Cyathea dissoluta*), organs of vegetative reproduction.

Discussion followed.

The meeting adjourned at 5:30 o'clock.

C. Stuart Gager,
Secretary.

April 9, 1907

The regular meeting for this date, announced on the weekly "Bulletin" to be held at the American Museum of Natural History, was postponed on account of a severe snowstorm.

C. Stuart Gager,
Secretary.

NEWS ITEMS

Miss Anna Murray Vail, librarian of the New York Botanical Garden, is in France, where she expects to spend the summer.

At the University of Chicago, Dr. Charles J. Chamberlain and Dr. Henry C. Cowles have been promoted to assistant professorships in botany.

Dr. J. W. Blankinship, recently professor of botany in the Montana College of Agriculture at Bozeman, now has a position at the Missouri Botanical Garden.

The seventh annual meeting and exhibition of the Horticultural Society of New York was held at the New York Botanical Garden on Wednesday and Thursday, May 8 and 9.

Dr. H. N. Whitford, of the Forestry Bureau of the Philippine Government, was scheduled to sail from Manila on April 15, on a leave of absence to visit the United States.

Dr. Herbert J. Webber, recently chief of the division of plant-breeding investigations of the U. S. Department of Agriculture, has begun his new duties as professor of plant biology in Cornell University.

It is stated in the April number of *The Plant World* that Mr. Carl F. Baker recently botanist of the Agricultural Experiment Station of Cuba has been elected professor of botany in Pomona College, Claremont, California.

Dr. Per Axel Rydberg, curator of the herbarium of the New York Botanical Garden, delivered an address at Augustana College, Rock Island, Illinois, on May 13, in connection with exercises commemorative of the two hundreth anniversary of the birth of Linnaeus.

Dr. Frederic E. Clements, professor of plant physiology in the University of Nebraska, was on May 2 unanimously elected professor of botany in the University of Minnesota, succeeding Conway MacMillan, who resigned this chair about a year ago in order to engage in business pursuits.

Mr. Ellsworth Bethel, instructor in biology in the East Side High School of Denver, Colorado, has installed his collection of Colorado plants, said to be probably the most complete in exist-

ence, in the rooms of the Colorado Natural History Society in the state capitol at Denver.

Dr. B. E. Fernow, chief of the forest division of the U. S. Department of Agriculture from 1886 to 1898, director of the New York State College of Forestry from 1898 to 1903, and recently professor of forestry in the Pennsylvania State College, has accepted the position of dean of the college of forestry of the University of Toronto.

Dr. E. B. Copeland, of the Bureau of Science and more recently of the Department of Education, of the Philippine Government, returned to the United States about the middle of March. Dr. Copeland has declined the offer of a botanical research position at the West Virginia University and has accepted the directorship of a newly established agricultural school in the Philippines.

Mr. Elmer D. Merrill, botanist of the Bureau of Science of the Philippines, sails from Manila for Seattle on May 15. He has a leave of absence for about nine months, and will spend some time in Washington, Cambridge, New York City, and Maine, returning later to Manila by way of Europe, where he hopes to devote three months to visiting herbaria, especially those at Kew and Berlin. Dr. Frederick W. Foxworthy will be in charge of the botanical department of the Bureau of Science during Mr. Merrill's absence.

The death of Sir Thomas Hanbury took place at his residence, La Mortola, Ventimiglia, on the Riviera, Saturday, March 9. He would have completed his 75th year on June 26, next, when it was proposed by the botanists of his acquaintance to give the day special notice. Sir Thomas was well known as founder of the Hanbury Botanical Institute of the University of Genoa and for the great garden of arid plants and succulents at La Mortola, where he welcomed the botanists of the world with true cordiality. — W. L. Jepson.

Pehr Olsson-Seffer, Ph. D. (Stanford, '04), recently director of La Zacualpa Botanical Station, Escuintla, Chiapas, Mexico, and since last September commissioner of tropical agriculture for the Mexican Government, returned to New York on May 6, from

an eight months' tour around the world. Dr. Olsson-Seffer's headquarters will now be in the City of Mexico, where he expects to arrive by June 1, stopping a few days in California *en route*. He intends soon to present a report to the Mexican Government on the condition of agriculture in other countries. Dr. Olsson-Seffer is editor-in-chief of a series of "Practical Handbooks on Tropical Agriculture," consisting of over thirty volumes, soon to be published by the Macmillan Company.

The press dispatches announce the death, on April 22, of Dr. Frans Reinhold Kjellman, professor of botany in the University of Upsala. Professor Kjellman was born November 4, 1846. He was officially connected with the University of Upsala from the year of his doctorate, 1872, to the time of his death, succeeding finally to the chair of botany once occupied by the distinguished Linnaeus. Between 1872 and 1880, he accompanied Nordenskiöld on three voyages to Spitzbergen, Nova Zembla, and the northern coast of Siberia, and after his return published several important papers on the flora of the regions visited, dealing especially with the marine algae and the phanerogams. Kjellman's elaboration of the Phaeophyceae for Engler and Prantl's Die natürlichen Pflanzenfamilien is perhaps the best known of his more recent publications.

The program of the course of Saturday afternoon lectures at the New York Botanical Garden for the spring of 1907 is as follows: April 27, "The Life Story of a Tree," by Dr. C. Stuart Gager; May 4, "The Flowers of Trees and Shrubs Growing Wild near New York City," by Dr. N. L. Britton; May 11, "Jamaica: Its Flora, Scenery, and Recent Disaster," by Dr. M. A. Howe; May 18, "Water Lilies and other Aquatic Plants: their Relation to Horticulture," by Mr. G. V. Nash; May 25, "The Influence of Vegetation in the Formation of Recent and Ancient Swamps," by Dr. Arthur Hollick; June 1, "Some Little Known Edible Fruits of the United States," by Dr. H. H. Rusby. The lectures are given in the museum building of the Garden, beginning at 4 P. M. They are illustrated by lantern-slides and otherwise.

The program of the commemoration of the two hundredth

anniversary of the birth of Linnaeus, on May 23, under the direction of the New York Academy of Sciences, includes, as previously announced in TORREYA, exercises in the forenoon at the American Museum of Natural History, in the afternoon in Bronx Park, and in the evening at the New York Aquarium and at the Museum of the Brooklyn Institute. The features of chief botanical interest will be the following: In the museum building of the New York Botanical Garden, from 2 to 3:45 P. M., there will be an exhibition of American plants known to Linnaeus, in charge of Professor L. M. Underwood, Dr. John K. Small, Dr. P. A. Rydberg, Dr. Marshall A. Howe, and Mr. G. V. Nash, and also an exhibition of the botanical writings and of portraits of Linnaeus, in charge of Dr. C. B. Robinson and Dr. John Hendley Barnhart. At 2:45 P. M., Dr. Per Axel Rydberg will deliver an address on "Linnaeus and American Botany" and an hour later Dr. H. H. Rusby will exhibit selected lantern-slides of North American flowers known to Linnaeus. From 3:45 to 4:30 P. M., such visitors as desire will walk or drive through the grounds of the Garden under the guidance of Dr. W. A. Murrill, who will point out characteristic American trees of species with which Linnaeus was acquainted. A bronze tablet commemorative of Linnaeus, a gift to the city from the New York Academy of Sciences, will be unveiled at 4:30 P. M. at the bridge, thereafter to be known as the Linnaean Bridge, over the Bronx River in Pelham Parkway, in that part of Bronx Park lying between the Botanical Garden and the Zoölogical Park. At the unveiling exercises an address will be made by Dr. N. L. Britton, president of the New York Academy of Sciences. The American Union of Swedish Singers will furnish musical numbers. At the Museum of the Brooklyn Institute, at 8 P. M., there will be an address by Mr. E. L. Morris on "The Life of Linnaeus" and by Mr. F. A. Lucas on "Linnaeus and American Natural History," and an exhibition of lantern-slides of "Plants and Animals Known to Linnaeus by Dr. A. J. Grout and Mr. F. A. Lucas." In connection with the Brooklyn exercises, songs will be rendered by the Glee Club of the United Swedish Societies.

The third regular meeting of the Botanists of the Central

States was held at Madison, Wisconsin, March 28–30, 1907. Professor F. C. Newcombe of the University of Michigan, the retiring president, read an address entitled "A Need in Botanical Science in America." Professor T. H. Macbride of the University of Iowa was elected president for the ensuing year.

The eighteenth season of the biological laboratory of the Brooklyn Institute of Arts and Sciences at Cold Spring Harbor, Long Island, will begin on July 3 and will continue six weeks. The courses in cryptogamic botany will be in charge of Professor D. S. Johnson of Johns Hopkins University and Mr. H. H. York of the University of Texas. Courses in plant ecology will be given by Dr. E. N. Transeau of the Carnegie Institution of Washington and Mr. W. S. Cooper of Johns Hopkins University.

Vol. 7 No. 6.

TORREYA

June, 1907

NOTES ON POLYEMBRYONY

By Melville T. Cook

Polyembryony has been reported as occurring in a large number of species. Braun * in 1860 reported polyembryony as known in twenty-one species, in thirteen genera, and in twelve families. Since that time it has been reported in a number of other species. The causes of this phenomenon are not thoroughly understood and are not always the same. Coulter and Chamberlain † give six different methods by which two or more embryos may be produced in a single seed and three forms of pseudo-polyembryony as follows:

True Polyembryony

A. Embryos derived from cells outside the sac, hence sporophytic tissue (vegetative multiplication or budding).

1. Embryos derived from cells of the nucellus.
2. Embryos derived from cells of the integument.

B. Embryos derived from cells within the sac (parthenogenesis and vegetative apogamy); although not in the same morphological category, embryos from the suspensor are also included in the list (vegetative multiplication or budding).

1. Normal occurrence of two eggs.
2. Embryos from synergids.
3. Splitting of embryos derived from egg.
4. Embryos from antipodal cells.
5. Embryos from endosperm cells.
6. Embryos from the suspensor.

* Braun, A. Ueber Polyembryonie und Keimung von Caelebogyne, ein Nachtrag zu der Abhandlung über Parthenogenesis bei Pflanzen. Abhandl. Kongl. Akad. Wiss. Berlin 1859: 109-263. 1860.

† Coulter and Chamberlain. Morphology of Angiosperms. 1903.

[No. 5, Vol. 7, of Torreya, comprising pages 89-112, was issued May 20, 1907.]

PSEUDO-POLYEMBRYONY

1. Ovules grown together.

2. Division of nucellus.

3. Development of several embryo-sacs in the same nucellus.

Probably the oldest record we have is that of Leeuwenhoek, who found polyembryony in orange seeds in 1719. It is very conspicuous in this genus and has been frequently mentioned in the literature. Although the number of seedlings from a single seed is usually only two or three, it may exceed that number and as many as thirteen seedlings from a single seed have been reported. Strasburger * has made a careful study of polyembryony in a number of species and has found that in the orange (*Citrus Aurantium*) all the embryos except those that developed from the fecundated eggs were produced by cells of the nucellus and to such he gave the name "adventive" embryos. That is to say, these adventive embryos were from the sporophytic tissue of the mother plant, were produced by vegetative multiplication or budding, and therefore derived their character from a single parent. This fact presented a very complicated problem in plant breeding, since in hybridization only those embryos which were produced by the fecundated eggs could possess characters derived from double parentage. This was proved by Webber and Swingle (†, ‡), who collected data for their work on a very large number of *Citrus* seedlings. They called attention also to the facts that the problem was doubly complicated because the hybrids frequently resemble the female parent and because the parents are frequently so similar in appearance that it is impossible to tell whether the seedlings are from hybrids or adventive embryos. However, they also state that the hybrid seedling is almost invariably more vigorous than the seedlings from adventive embryos, a fact which undoubtedly facilitates the work of the plant-breeder to some extent.

* Strasburger, E. Ueber Polyembryonie. Jenaisch. Zeitsch. Naturwiss. **12**: 647–670. 1878.

† Webber, H. J. Complications in Citrus Hybridizations caused by Polyembryony. Science II. **11**: 308. 23 F 1900.

‡ Webber, H. J., & Swingle, W. T. Yearbook of the Department of Agriculture, 1904: 226, 227.

The writer has recently made some observations upon the seedlings of *Mangifera indica* and *Eugenia jambos*, both of which

FIGURE 1. Germinating seeds of the mango (*Mangifera indica*). One of the seeds is producing eight seedlings.

are tropical trees. In the germination of the seeds both of these species are strikingly similar to the orange. The mango (*M. in-*

dica) also was studied by Strasburger * who reported that it also produced adventive embryos. The writer's observations confirm this view. The seed splits first at the large end and then gradually down the edges. From this opening the seedlings grow, usually more than one and frequently as many as eight. In most cases one seedling is considerably in advance of the others. An examination of the seed about the time of germination shows that the nucellus is broken up into irregular pieces of variable

FIGURE 2. Eight seedlings of the mango (*Mangifera indica*) from the single seed, showing the blocks of nucellus, each producing a seedling.

sizes and that each piece produces a seedling. The writer observed this same tendency for the nucellus to break into pieces in the *Citrus* fruits also but does not know that each of these pieces produces a seedling. The surfaces of these pieces are smooth and apparently along well-defined. cleavage planes. The writer is unable to say whether the strongest embryo is from the fertilized egg or not.

* Loc. cit.

Polyembryony was also very common in the rose-apple (*Eugenia Jambos*) but usually the number of seedlings did not exceed three from a single seed. Examination of the mature seeds showed that they also were separated into pieces as in the case of the orange and the mango. However, there were usually two or three, rarely more large pieces and a number of very small pieces. The seedlings were produced from the large pieces. Apparently this is another case of adventive seedlings, the same as found in the orange and the mango.

FIGURE 3. Three seedlings of *Eugenia Jambos* from a single seed.

The writer made an attempt to study the embryology of these species but the material was unsatisfactory and he did not have another opportunity to collect material before leaving Cuba.

The mango is recognized as a very important fruit in the tropics and also as one which presents great commercial possibilities. But before it can be of very great value it must be the subject of careful study and experimental work by the plant-breeder and the horticulturist, and then this tendency to polyembryony will present a much more complicated problem than in the case of the orange, since on account of the character of the foliage it will be much more difficult to determine which of the embryos are true hybrids.

DELAWARE AGRICULTURAL EXPERIMENT STATION,
NEWARK, DELAWARE.

SUGGESTIONS FOR THE STUDY OF THE LACTARIAE *

By Gertrude Simmons Burlingham

There are only a few species of *Lactaria* which can be identified positively from dried specimens in the absence of field-notes. Furthermore, one who is not more or less familiar with the distinguishing characteristics of the species in this genus may make seemingly ample notes and yet omit some of the vital points, with the result that much otherwise valuable material becomes worthless or even misleading. Any such waste of time and material is especially lamentable in view of the fact that only a few scattered regions in the United States have been explored at all for any genus of the fleshy fungi. Approximately ninety species and varieties of *Lactaria* have been reported from the United States, fifty † of which have been described as new species ; but of this number only five have been described from states west of the Alleghany Mountains, while from the majority of the states west of this line no species whatever have been reported. An economic as well as a scientific interest attaches to the genus, since *Lactaria deliciosa* and *Lactaria volema* are among the choicest of the esculent mushrooms, and several other species are considered nearly as palatable.

The generic characters are conspicuous. The exudation from cuts and bruises in the flesh or gills, of a white or colored juice having the consistency of milk, is usually sufficient to mark the specimen as a *Lactaria*. In common with the *Russulae*, the *Lactariae* have a vesiculose structure which gives the flesh of both the stem and the pileus a cellular appearance much like pith, and in consequence of this structure the flesh is readily broken and is never fibrous or tough, and the stem is never cartilaginous. The genus is characterized also by the occurrence

* In Tent. Disp. Meth. Fung. 1797, Persoon uses the term *Lactaria* as a generic name, thus antedating the *Lactarius* of Fries by nearly half a century. At the time of publication of "Some Lactarii from Windham County, Vermont," I was unable to obtain this book for consultation.

† It is possible that some of these may prove not to be good species.

in many species of concentric bands of deeper color on the surface of the pileus, producing what is termed a zonate pileus. The *Lactariae* are found chiefly in woods or on the border of woods, and they vary in size from species with the pileus less than 2 cm. broad to species having a pileus 15 cm. or more across.

MILK. — The first field-note to be made is regarding the color of the milk and whether the color changes upon contact with the air. Sometimes when the milk is at first white and then changes to some shade of yellow, the change comes so rapidly that careful observation is necessary to detect that the milk is white at first. This is true in *Lactaria resima*. Again a change may not be noticeable for several minutes. A collector should always be positive as to whether or not the color of the milk does change upon exposure to the air. It may be that wounds will be discolored, while the milk remains white, as in the case of *Lactaria volema*, in which the gills and flesh become brownish where injured. *Lactaria fuliginosa* has white milk which according to European mycologists changes to salmon. In the American species the gills and cut flesh show the change very decidedly but a drop of the milk remains white except where in contact with the flesh. In order to distinguish between such changes, it is necessary to watch a large drop of milk until satisfied as to the truth. It is always well to state in the field-notes "milk white, unchanging" or "milk white, changing" in order to indicate that such careful observation has been made.

It is also necessary to know the taste of the milk. This may be mild, that is with no decided taste, or sweetish, or the milk may be mild at first and in fifteen seconds or more become peppery on the tongue; sometimes it is bitter and astringent, and again it may be extremely acrid from the first as in *Lactaria piperata*. Since the taste differs sometimes in young and old specimens, it is best to taste more than one. None of the *Lactariae* so far as is known are extremely poisonous, and there will be no danger in tasting the milk, but it will be advisable not to swallow the juice.

PILEUS. — One of the distinguishing points of a species is the

color of the pileus. Not only is this a variable character, but two collectors may describe the same color in different terms. Much difficulty can be avoided if a collector uses some standard color scheme, as Saccardo's *Chromotaxia*. Perhaps the most complete and satisfactory color chart is *Répertoire de Couleurs* published by the French Society of "Chrysanthémistes," which gives 365 distinct colors in various tones, including the reproduction of the colors recognized by Saccardo. The color description should be made as soon as possible after collection and should include the color of young, mature, and old specimens. If the pileus is zonate, the zonation should be described carefully.

It is also necessary to note the character of the surface of the pileus. In some species the pileus is never viscid, in others viscid only in wet weather, and in still other forms, the viscidity is more or less persistent. When *Lactariae* are collected in dry weather, special means must be used to determine positively whether the pileus is viscid when wet. This may be determined by standing the mushrooms in water for a short time or by placing them in the grass where they will be covered with dew during the night. As a rule the other surface characters will be preserved in drying, but sometimes these may be fugacious. For example, the pileus of young plants may have a tomentose covering in whole or in part, which will disappear in the mature specimens. The extreme edge of the pileus is often minutely tomentose at first and later glabrous. On the other hand, the pileus may be glabrous at first and later squamulose or rimulose. Any such peculiarities should be mentioned in the field-notes.

GILLS. — The color of the gills should be observed both in young and mature plants, and note made whether the color changes with age, or where the gills are wounded. Although the arrangement of the gills can be told from the dried specimen, it can be determined more readily from the fresh mushroom. This is especially true in cases where the gills branch. A drawing showing the number of gill series, the branching and the closeness is better than a description. The color of the spores differs in the species, so that a rough spore-print ought to be made in order to see the color in mass.

Stem. — The important points in connection with the stem are the color, shape, character of the surface, and the texture of the flesh, that is, is the stem pithy at first, then hollow, or is it firm even in old age?

Habitat. — The character of the habitat is of special consequence; whether pasture, woods, open groves, or swamp; the kind of trees predominating in the immediate vicinity, and the species under which the fungi were growing; the kind of soil and the moisture content; the locality and the elevation. Also, is the species solitary or gregarious in habit, and what size do the mushrooms attain?

Collecting and Preserving. — Of course it is of primary importance that the different specimens or "numbers" gathered should be kept distinct. This is easily accomplished by carrying in the collecting basket a supply of various sized paper sacks, and a species may then be placed in a bag with the accompanying field-notes. Like care must be used during the process of drying the mushrooms; for the mushrooms must be dried and preserved, since the descriptions are as useless without the dried specimens as are the latter without field-notes. The *Lactariae* may be dried successfully by spreading them on a wire screen which may be put under the kitchen stove or suspended about three feet above it. Oven heat is liable to be too great for the best results. When possible, three or four typical specimens of a species should be preserved, representing both young and mature condition. When dry, the mushrooms, together with the field-notes, may be transferred to paper sacks again, or to suitable boxes, and filed away for future study and identification. If some time is to elapse before this study is to be undertaken, something like naphthaline flake ought to be put in the boxes to protect the mushrooms from the attacks of the larvae of moths and carpet beetles.

The following outline contains the essential points for field-notes and at the same time a minimum amount of information necessary for the determination of species. Of course, it is evident that drawings or water-color sketches will be a valuable addition to the notes. The appended bibliography will form a working basis for the identification of the *Lactariae*.

Locality.. ....Date.. ....
Habitat... ....
Milk
color................ ....change ....taste............
Pileus
color, zonate or azonate.... ....
surface, dry or viscid ....
glabrous or pruinose, squamulose, pubescent, tomentose
....
margin, glabrous, pruinose, downy, tomentose,.....................
even or striate.. ....
Stem
color ....shape................ ....
surface, dry or viscid.................. ....
glabrous, etc... .
substance, solid, or lax, becoming hollow............................
Gills
color..... ...does the color change with age ....
where bruised ....
number, distant or close................ ....
arrangement, entire or branched, number of series ....
Spores
color in mass.................. ....
Flesh
color, does it change where broken.................................
odor ....
Size of plants ....
Solitary or gregarious.. ....

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New York Botanical Garden.

ADDITIONS TO THE TREE FLORA OF THE UNITED STATES

By J. K. Small

In a previous paper * I recorded the discovery of six trees new to the flora of the United States. Four of the species there mentioned, namely *Quercus Rolfsii* Small, *Ilex Krugiana* Loesener, *Rhus leucantha* Jacq., and *Tetrazygia bicolor* (Mill.) Cogn., are indigenous to Florida, while two species, *Mangifera indica* L., and *Sapota Zapotilla* (Jacq.) Coville (*Achras Sapota* L.) are naturalized plants.

Further exploration in South Florida has revealed six additional arboreous plants, which are as follows:

Serenoa serrulata (Michx.) Hook. As far as we are aware, throughout the range of this species in North Carolina, South Carolina, Georgia, and northern Florida, the stem never rises above the surface of the ground. In South Florida, under quite similar conditions, the stem not uncommonly stands erect or

* Additions to the Flora of Subtropical Florida. Bull. N. Y. Bot. Gard. 3: 419–440. 1905.

nearly so, although more commonly it is horizontal as in the case of the plants growing further north. On the dunes back of the beach opposite Miami, plants with erect stems ten to twelve feet tall are quite common. There is a small grove in the pinelands north of Arch Creek on the mainland seven or eight miles north of Miami, consisting of taller plants, the stems of some measuring twenty-six feet in height. The upright plants have no floral characters to separate them from the horizontal-stemmed ones, but the foliage is usually more glaucous. I have not yet been able to discover the reason for the plants assuming the two distinct habits, for both the erect and horizontal-stemmed forms occur in close proximity, growing both in deep sand or on almost bare coral rock.

CHRYSOBALANUS PELLOCARPUS Mey. This species as it occurs in Florida is strongly contrasted with *Chrysobalanus Icaco* L. The plants of the latter species are mainly confined to the sand dunes near the beach and the contiguous regions. In the everglades it is apparently replaced by *Chrysobalanus pellocarpus* Mey. This species differs from *C. Icaco* in its smaller, narrower, usually abruptly pointed or rounded leaf-blades, the smaller flowers with typically spatulate petals, and the obovoid or oblong-obovoid drupes with narrow sharp-ridged stones.

ALVARADOA AMORPHOIDES Liebm. The discovery of this tropical plant in Florida has already been recorded * but hitherto it was known within our limits only as a shrub. In the hammocks near the trail that crosses Long Prairie a few miles northeast of Camp Longview small trees varying between twenty and thirty feet in height are not uncommon. It attains about the same development as *Tetrazygia bicolor*, with which it grows.

SURIANA MARITIMA L. The greatest height to which this seashore plant was formerly known to attain seems to have been about six feet. I have seen it growing at many places on the coast of South Florida and with the exception of the instance to be mentioned the specimens were invariably less than six feet tall. However, in the fall of 1904, I discovered it growing as a tree on the western shore of Elliott's Key at a point about twenty-

* Bull. N. Y. Bot. Gard. 3: 424. 1895.

five miles south of Miami. There the plants grew along the shore for a distance of about one hundred feet, the larger ones attaining a height of about thirty feet with a maximum trunk-diameter of fully one foot.

Solanum verbascifolium L. This species of *Solanum* occurs as a tree both on the mainland of southern peninsular Florida and on the Keys. In the hammocks throughout the homestead country southwest of Cutler, plants of this species are not uncommon and they sometimes grow to a height of between twenty-five and thirty feet with a trunk-diameter varying from six to eight inches. On the Keys, for example on the western side of Elliott's Key, the plants reach about the same proportions, assuming however a somewhat more stocky habit, being not quite so tall but with a greater trunk-diameter.

Genipa clusiifolia (Jacq.) Griseb. In the hammocks near the coast the plants of this species are usually irregularly branched shrubs. On the dunes along the seashore they commonly occur as diminutive trees varying from two to six feet in height. Their habit there resembles that assumed by *Terminalia Catappa*, that is, with the branches whorled in several tiers. In a hammock on the dune several miles south of Fort Lauderdale I have found many plants as fully developed trees, some of the trunks measuring over one foot in diameter.

New York Botanical Garden.

SHORTER NOTES

A new Spruce from the Canadian Rocky Mountains. — In a landscape in the Canadian Rocky Mountains in Alberta or British Columbia, probably the most striking feature is the slender spruces, which at the lower altitudes in the wet grounds and river bottoms are frequently found growing to the exclusion of all other trees. The species has been referred by authors to both *Picea canadensis* (Mill.) B. S. P. and *P. Mariana* (Mill.) B. S. P., to both of which it bears a certain resemblance, but from two months' experience with the tree during the past season, in the region from Banff, Alberta, to Field, B. C., I am satisfied that it is quite distinct from either, and therefore propose for it the following name:

Picea albertiana sp. nov. — A slender tree, attaining a height of over 15 m. Twigs and sterigmata smooth and shining or occasionally slightly glandular but never glaucous, yellowish-brown when young becoming darker with age; sterigmata strongly reflexed and standing out frequently more than 1 mm. from the twigs: leaves pale-blue or blue-green, surrounding the stem and crowded toward the upper side, at the ends of the branches, 1.5 cm. to 2.5 cm. long, 4-sided, with 3, 4, or sometimes 5 rows of stomata on each side, incurved, acute or acuminate with a rigid tip: cones ovate, bright-crimson when young, at maturity 2.5 cm. to 3.5 cm. long and nearly as broad when expanded, early deciduous; scales stiff and rigid, broadly rounded at the apex, entire, broader than long, cinnamon-brown with a chestnut edging and shading to darker chestnut toward the base; bract 2 mm. or less long, 1 mm. broad, with a sharply angular, more or less acute erose tip.

Type *no. 796, S. Brown*, Bankhead, Alberta.

The common spruce of the lower altitudes through the Canadian Rockies in Alberta and British Columbia, differing from *P. canadensis* (Mill.) B. S. P. in the longer, strongly reflexed sterigmata, shorter, broader and darker colored cones, with broadly rounded scales and minute sharply angled bracts, and from *P. Mariana* (Mill.) B. S. P. in the lighter colored, smooth twigs with longer sterigmata, and light-blue or blue-green leaves, and cones with broader, entire scales with angular-tipped bracts.

STEWARDSON BROWN.

ACADEMY OF NATURAL SCIENCES,
PHILADELPHIA.

PROCEEDINGS OF THE CLUB

APRIL 24, 1907

The meeting was called to order at the museum building of the New York Botanical Garden, at 3:40 P. M. with Dr. M. A. Howe in the chair. Twenty persons were present.

The minutes of the meeting of March 27, 1907, were read and approved, and also a note recording the postponement of the stated meeting of April 9th, 1907.

Mr. Edward B. Chamberlain, 38 West 59th St., N. Y. City, was nominated for membership.

The resignation of Mrs. H. A. DeCoster, dated March 25,

1907, was read, and the death of J. Schneck, M.D. was reported. On motion the resignation of Mrs. DeCoster was accepted.

A communication to Dr. N. L. Britton, from Professor L. R. Jones was read, containing an invitation to the Torrey Club from the Vermont Botanical Club, to join the latter in its annual field meeting at Pownal, July 1 to 3. Dr. Britton had already replied to the invitation and it was received and ordered to be placed on file.

An invitation was read from the New York Academy of Sciences inviting the Torrey Botanical Club to participate in the celebration of the two hundredth anniversary of the birth of Carl von Linné, on May 23, by sending an authorized representative, and by presenting an official document, commemorative of the life and work of Linné, to be read at the exercises.

It was unanimously voted that Dr. Rusby, the president of the Club, act as the authorized representative of the Club at the coming celebration, and, on vote, the chairman of the meeting was authorized to appoint a committee, with power, to arrange for the preparation of the commemorative document to be read at the anniversary exercises. The following committee was appointed: Dr. W. A. Murrill, Mrs. E. G. Britton, Dr. Tracy E. Hazen.

The program committee was, on vote of the Club, authorized to arrange, if possible, to hold the next meeting of the Club at Teachers College, Columbia University.

By unanimous consent the secretary cast the vote of the Club electing Mr. Chamberlain to membership.

The following scientific program was presented:

"Ecological Distribution of the Beach and Dune Flora about Chicago, Ill.," by Miss Mary Perle Anderson.

Miss Anderson gave a brief account of the geological history of the ancient Lake Chicago and its succession of beaches, the Glenwood, the Calumet, and the Toleston. These ancient beaches were formed by changes in the lake-level and at the present time are indicated by ridges of wooded land more or less parallel to the present coastal beach of Lake Michigan. The ridges are separated by the low level prairie land which makes up the Chicago plain.

The formation of the dunes along the present shore of the head of Lake Michigan was considered, and also the changes in the flora that may be noted as one passes from the naked shifting dunes and extremely xerophytic conditions of those recently fixed, to the dunes farthest inland, where mesophytic conditions prevail. Certain grasses, species of *Calamagrostis*, *Andropogon*, *Ammophila*, and *Elymus*, do much to bind the dunes. The first trees to appear are the cottonwood and certain willows, which are also of value in fixing the dunes. The scrub-oak and black oak soon appear and are followed by the bur-oak, the white oak, and the red oak. *Pinus Banksiana* is followed by the white pine; the pig-nut hickory is succeeded by the shag-bark; other trees, such as the basswood, ash, cherry, and black walnut, come in, and on the most mesophytic slopes of the oldest dunes and beaches one finds the sugar-maple and, more rarely, the beech, hemlock, and southern tulip-tree. Corresponding changes in the shrubby and herbaceous vegetation occur, and at Stevensville and Porter, one may pass in a short time, from extreme desert conditions through successive stages of the open forest of low trees and shrubs to the oak-hickory type and finally to the beech-maple-hemlock combination, which indicates the culmination of the forest in this region.

The usual ecological factors, heat, light, water, soil, wind, and direction of slope, all have their influence on the floral distribution. Conditions in the dunes are extreme. Thus, for example, the trailing-arbutus and the bearberry, both northern types, may appear on the north-facing slope of a dune, while just over the crest, on the south-facing slope, the cactus may flourish.

Emphasis was laid on the fact that species vary with environment, often losing more or less of their xerophytic adaptations under mesophytic conditions; that a plant-society is only a stage in the development of a region; that the apparent tendency is for all to approach the mesophytic condition.

The paper was discussed by Dr. Grout and Dr. Rydberg.

"Some Relations between Habitat and Structure in Mosses," by Dr. A. J. Grout.

Xerophytic mosses apparently tend to develop short, thick-

walled leaf-cells, often with papillae over the lumen. Nearly all mosses with papillae over the lumen of the cell are xerophytic, or belong in groups that are largely xerophytic. Presumably the papillae tend to retard transpiration.

Pleurocarpous mosses growing on trees tend to develop short thick-walled cells, especially at the basal angles of the leaves, and a similarity of leaf-structure in the tree-growing mosses due to this fact has produced much of the confusion and uncertainty in classifying such mosses, *e. g.*, *Alsia*, *Dendroalsia*, *Bestia*, *Groutia*, and their relatives.

Tree-growing mosses also tend to develop erect capsules, and the correlated imperfect peristomes. To some extent this seems to apply to other xerophytic mosses.

Aquatic or subaquatic pleurocarpous mosses have an apparent tendency to develop enlarged and inflated alar cells.

Cleistocarpous and gymnostomous mosses appear, for the most part, to be mosses of various relationships adapted to damp soil, not closely covered with other vegetation, and best suited to support a rather short-lived annual moss.

The speaker recognized numerous exceptions to the above relationships, if stated as general principles, but, stated as tendencies, he believes they are worthy of serious consideration by the systematist, the morphologist, and the ecologist.

A brief discussion followed.

The Club adjourned at 5:20 P. M.

C. STUART GAGER,
Secretary.

MAY 14, 1907

The meeting was called to order at the American Museum of Natural History with President Rusby in the chair. One hundred and four persons were present.

The reading and approval of the minutes for April 24 was followed by the presentation of the names of the following persons for membership:

Mr. Theodore Gottschalk, 2311 Second Ave., N. Y. City; Mr. W. H. Liebelsperger, Fleetwood, N. J.

The committee appointed at the preceding meeting to arrange

for the preparation of the commemorative document to be read at the celebration, by the New York Academy of Sciences, of the two hundredth anniversary of the birth of Carl von Linné, reported, through the secretary, that Professor Underwood had been appointed to prepare the document, and had accepted.

On motion the secretary cast the ballot of the club, electing to membership the persons nominated.

The scientific program consisted of a symposium of four papers on the subject of "Trees." Each paper was illustrated by lantern views. The symposium was opened by Professor L. M. Underwood, who spoke on "Some Historic American Trees." Mr. William Solotaroff discussed "The Planting and Care of Shade Trees," giving an interesting account of the preparation for planting in the nursery, methods of transplanting along highways and streets, the dangers that threaten shade trees, and briefly of the means of protection against these dangers.

Dr. E. B. Southwick spoke on "Trees in Winter," showing views taken in Central Park, and elsewhere in and about Greater New York. The last number was by Dr. N. L. Britton, who showed a selection of colored lantern slides from the Van Brunt collection, illustrating the flowers and fruits of common trees.

At the conclusion of the regular program, Mr. Edward R. Taylor, of Penn Yan, N. Y., exhibited some beautiful, and botanically interesting, samples of vegetable silk, and fabrics woven from it, together with the raw material of which it is made. The process of its manufacture from cotton-seed cellulose was briefly described, and samples of "artificial horse-hair," made by treating ordinary cotton thread with the dissolved cotton-seed cellulose, were also exhibited and the process of its fabrication briefly described.

The Club adjourned at 10:30 o'clock.

C. Stuart Gager,
Secretary.

NEWS ITEMS

Dr. J. E. Kirkwood has recently been promoted to a professorship of botany in Syracuse University, and the botanical work there is now recognized as an independent department of the university instruction.

Mr. Guy West Wilson (M. S., Purdue University, 1906), who during the past year has been engaged in mycological studies at the New York Botanical Garden, has been appointed professor of biology in the Upper Iowa University at Fayette, Iowa, and expects to begin his work there next autumn.

Fred Jay Seaver, university fellow in botany in Columbia University during 1906–'07, has been appointed assistant professor of botany in the North Dakota Agricultural College and assistant botanist of the agricultural experiment station at Fargo, North Dakota.

Mr. Edward Lyman Morris, who has been connected with the high schools of Washington, D. C. since 1895, and since 1900 head of their biological departments, has been appointed curator of natural sciences in the Museum of the Brooklyn Institute of Arts and Sciences, the appointment taking effect from July 1.

At the one hundred and fifty-third commencement of Columbia University on June 12, those who received advanced degrees in connection with the work carried on in the department of botany were Elsie Kupfer, who was granted the degree of doctor of philosophy, and Mary Morrell Brackett, Alice Adelaide Knox, Helen Letitia Palliser, and Maud J. Staber, who received the degree of master of arts.

The fourth annual field "Symposium," in which the Philadelphia Botanical Club, the Washington Botanical Club, and the Torrey Botanical Club will coöperate, will be held in the interesting region about Swartswood Lake, Sussex Co., New Jersey, July 1 to 8. The headquarters of the Symposium will be at the Hotel Waldmere, in the town of Newton, where a rate of $10 for the week has been secured. Those who expect to attend are requested to notify Mr. Joseph Crawford, president of the Philadelphia Botanical Club, 2824 Frankford Avenue, Philadelphia, Pa.

The summer meeting of the Vermont Botanical Club will be held in Pownal, July 2 and 3. Pownal is the extreme southwestern township of the state and it includes the only Vermont stations for *Liriodendron Tulipifera* and several other species of plants, and is said to be also the only known station in New

England for *Aster sagittifolius* and a few other species. The limestone region about North Pownal produces most of the rare plants but the extensive bogs in the eastern part of the town offer much of interest to botanical collectors. The headquarters for the meeting will be at the Hotel Glenwood, North Pownal, where members and their friends will assemble on the evening of July 1.

Benjamin Davis Gilbert, well known as an amateur student of the ferns, died at his home in Clayville, New York, on June 3, in the 72d year of his age. Mr. Gilbert was a graduate of Hamilton College in the class of 1857. From 1860 to 1876 he was engaged in the book trade in Utica, N. Y., and from 1877 to 1888 he was connected with the *Utica Morning Herald*, during much of this time as as literary editor and later as agricultural editor. Between 1892 and 1897 he was secretary of the New York State Dairymen's Association and edited its annual reports. Mr. Gilbert's interest in ferns began in early life. In addition to his personal collections in the United States, he had gathered ferns in Martinique, St. Thomas, Jamaica, and Bermuda. His botanical papers were published chiefly in the *Fern Bulletin* and in the *Bulletin of the Torrey Botanical Club*.

Vol. 7. No. 7.

TORREYA

July, 1907

NOTES ON SOUTHERN VIOLETS — II

By Homer D. House

In Small's Flora of the Southeastern United States, Mr. Pollard, who has contributed the treatment of the Violaceae, does not credit *Viola cucullata* Ait. to this region. This species does however occur in this region and is represented by two rather distinct forms. Applying to them the key for the species of *Viola* in Small's Flora places them under *V. papilionacea* Pursh, as described by Mr. Pollard. *Viola papilionacea* is of a different group of species from *V. cucullata* and is recognized by its horizontal or ascending cleistogamous flowers on short peduncles, developing into short, blunt capsules, the sepals of the petaliferous flowers never with the prominent basal auricles of *V. cucullata*. In fact, *Viola cucullata* has more in common with *V. Brittoniana* than with any other species. Professor Greene * recognizes more than one species in the *V. cucullata* of recent manuals and, of these, *V. macrotis* is very distinct from the common form of *V. cucullata* in leaf character and habitat. In the southern Appalachian mountains it is the commonest representative of the group, while in the wet places along streams of the Piedmont region adjacent to the mountains another species is found.

Viola macrotis Greene, Pittonia 5: 97. N 1902.

Leaves of the summer foliage with pale-green, subsucculent blades, broadly ovate, acute, shallowly cordate, crenate-dentate, 6–10 cm. long and frequently broader, slightly pubescent on the veins beneath and on the peduncles: petaliferous peduncles exceeding the leaves until well after the flowering period: cleis-

* Pittonia 5: 96–101. N 1902.

[No. 6, Vol. 7, of Torreya, comprising pages 113–132, was issued June 19, 1907.]

FIGURE 4. *Viola oconensis* House; *a*, plant, nat. size; *b*, a lateral sepal, $\times 4$; *c*, an upper sepal, $\times 4$; *d*, detail of petals, nat. size.

togamous flowers erect on shorter peduncles, and the subsequent capsules 10–14 mm. long, angled and acute.

Moist shady stream banks and around springy places in the deeper coves of Rabun Bald, Rabun Co., Georgia, alt. 2000–3500 ft. *H. D. House, 2296*, June 1–4, 1906.

Viola oconensis sp. nov.

Related to *V. cucullata* of the north. Rootstock ascending, branched, often elongated: early leaf-blades round-ovate, shallowly cordate, obtuse, crenate, 1.5–3.5 cm. long, glabrous: summer foliage appearing with the flowers; petioles 8–15 cm. long, slender, pale and glabrous or with a few scattered hairs; blades oblong-ovate in the earlier leaves to triangular-ovate in the later ones, 4–5 cm. long, 2–3.5 cm. broad, acute to subacuminate, deeply cordate and cucullate at the base, crenate or crenate-serrate, bright-green, rather thick and firm in texture, the veins prominent beneath, hispidulous above with minute whitish scattered hairs or glabrous with age: peduncles mostly exceeding the leaves at all stages, glabrous or slightly pubescent, 10–30 cm. long, bracts minute, subulate, not opposite: sepals linear-lanceolate, long-pointed, with whitish margins, 10–14 mm. long, the basal auricles prominent, blunt, the auricles and sometimes the margins of the sepals with a few short cilia: corolla 2–3 cm. broad, bright-blue but not purplish, the upper and lateral petals broad and rounded, the lower petal lance-oblong, obtuse and conspicuously veined with purple, the lateral pair bearded with small tufts of white papillae: cleistogamous flowers acute, erect on peduncles 8–20 cm. long, their capsules about as long as the sepals, acute. [Figure 4.]

In swampy thickets of elder and smilax along a small "branch" near Clemson College, Oconee Co., South Carolina, *H. D. House, 1839*, April 16, 1906, alt. about 800 ft. (type in the Clemson College herbarium; duplicate types in the herbaria of the New York Botanical Garden and the National Museum). Near Pendleton (but in the S. E. corner of Oconee Co.) *H. D. House, 1801*, April 10, 1906.

At the last-named locality *V. sagittata* Ait. was abundant on an open wooded slope above, and around the margin of the swampy thicket in which grew *V. oconensis*, occurred several plants of intermediate appearance.

Viola oconensis × sagittata hyb. nov.

The early leaves with deltoid-ovate blades similar to those of *V. emarginata*, the later leaf-blades lanceolate-oblong, showing at the base both cucullate and sagittate characters ; slight traces of pubescence often found on the upper leaf surfaces and peduncles : the flowers large, 2–3 cm. broad and purplish-blue ; petaliferous flowers apparently not developing capsules, the peduncles withering soon after flowering : cleistogamous flowers numerous but their capsules small and abortive.

Low meadows, bordering swamps in which occurs *Viola oconensis ;* near Pendleton (but in Oconee Co.) South Carolina, *H. D. House, 1804*, April 10, 1906.

The extent of my field studies thus far shows that this region is no exception to those localities already studied by the writer in regard to the abundance of natural hybrids among the violets. Many forms are under observation and the hybrids thus far detected are as follows :

Viola emarginata × *sagittata* Brainerd, Rhodora **8** : 58. 1906.
Tomassee, Oconee Co., *H. D. House, 2026*, May 5, 1906.

Viola emarginata × *papilionacea* House, Rhodora **8** : 120. 1906.
Open coves at limit of cultivation, Rabun Bald, Rabun Co., Georgia, *H. D. House, 2254*, June 1–4, 1906.

Viola palmata × *villosa* Brainerd, Rhodora **8** : 56. 1906.
Open woods with *V. palmata* and *V. villosa*, near Clemson College, Oconee Co., South Carolina, *H. D. House, 1930*, April 25, 1906.

Viola affinis × *villosa* Brainerd, Rhodora **8** : 56. 1906.
Near Clemson College, Oconee Co., S. C., *H. D. House, 2357a*, June 15, 1906.

Clemson College, South Carolina.

NOTES ON SOME FERNS COLLECTED NEAR ORANGE, NEW JERSEY

By Ralph Curtiss Benedict

The ferns under consideration were collected on a trip with the Torrey Botanical Club on June 22, 1907. The route lay over part of the range of hills known as the Orange Mountains,

and included in its course a variety of wooded hills and swamps and open fields.

An old well contained the first fern of especial interest, a small plant of the Japanese *Cyrtomium falcatum*, a fern commonly cultivated for fern-dishes, and related to our genus *Polystichum*. Its occurrence at that place is explained by the presence of a greenhouse near by, from which the spore which produced this plant was presumably blown. It grew in a crevice of the well-coping, protected from either extreme heat or cold by the partly open flooring of the well-house, and was of a size to indicate that it lived through at least one winter. With a little protection, it should prove hardy in the latitude of Washington and further south.*

Of the native ferns, about twenty species were seen, including members of eight genera of the Polypodiaceae, of *Osmunda*, and of *Botrychium* and *Ophioglossum*. The last was found in an old sedgy meadow, apparently a former lake which had been filled in by vegetative growth. After a close search, a considerable supply was found but it was not yet matured. For those who have not found this fern growing, a descriptive note may be of interest. The texture is soft and flabby, almost exactly like that of the common sheep-sorrel, *Rumex Acetosella*, but the color is lighter and the leaf, of course, is not lobed.

A low wet woods in the same valley contained a fine series of the *Dryopteris marginalis-spinulosa-cristata* group, including some of the less common members.

D. MARGINALIS, in its normal form, was found here and throughout the trip.

D. SPINULOSA. The form usually considered the type was found several times. It seems to be commoner in this region than the variety *intermedia* and grows generally in low damp woods. In central and northern New York, the reverse is true. The common form is *D. spinulosa intermedia*, which frequents rocky slopes and upland woods, but is found at its best on shady exposures. The form I identify as the type varies considerably in the cutting of the frond, but is probably never so much

* The writer has since seen this fern in cultivation out-of-doors at Stamford, Conn., where it is protected in the winter by a few inches of leaves.

divided as the variety, and the pinnae and pinnulae are generally more distant. It may include more than one form.

D. SPINULOSA INTERMEDIA. Only one or two clumps were found. Besides the characters ordinarily given, this variety may be distinguished from the preceding in two respects. It matures its sori a month or more earlier; in this latitude, about the middle or last of June. Its sporangia appear dark-brown or blackish, as compared with the pale-brown sporangia of the so-called type form. There seems to be some question whether the type form really occurs in this country. A representative set of the species, comprising our three recognized forms, was sent to Dr. Christ of Basel, Switzerland, who identified all the specimens as *D. spinulosa exaltata*, a European variety. This, however, was not justified by the material.

Is it not probable that we have included under this species a complex of independent and mostly coördinate forms, corresponding, perhaps, to the known varieties; in other words, elementary species? Such forms as appear to intergrade might be explained as crosses. A point in favor of this explanation is found in the fact that not infrequently such intermediate forms have only abortive sori and sporangia, a character nearly always associated with the recognized hybrids of *Dryopteris*.

D. CRISTATA. Frequent, the commonest of the group.

D. CLINTONIANA (D. C. Eaton) Dowell * (*D. cristata Clintoniana*). Distinguished from the preceding by its much broader and larger fronds; the sori, also, are much closer to the midveins of the pinnulae. Several plants were seen.

D. BOOTTII. One group of vigorous plants.

D. CRISTATA × MARGINALIS. One group of strong plants with hardly an abnormal frond.

Cultural and field work is being carried on with the hope of clearing up some of the points of difficulty regarding these species and the writer would be glad to exchange material collected in this locality and in central New York for specimens from other sections.

NEW YORK BOTANICAL GARDEN.

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* Proc. Staten Is. Assoc. 1: 64. My 1906.

A ROUND-LEAVED RED RASPBERRY

BY WILLIAM H. BLANCHARD

Our red raspberry (*Rubus strigosus* Michx.) is somewhat variable, though probably much less so than the rather closely related *R. Idaeus* L. of the Old World. A careful study of the variations of our species would be very interesting and is in fact much needed. Until quite recently no variation had been noticed which seemed to merit separation as a species or a variety, though it is possible that some had been found to which names as forms might have been given with advantage, thus stimulating more careful observation and record.

But, on June 9, 1900, Mr. W. W. Eggleston, then living in Rutland, Vermont, found a remarkable plant in Cavendish, Vt., on the Black River near the Ludlow line. It was described by Mr. M. L. Fernald, of the Gray Herbarium, to which it was sent, in Rhodora **2**: 195–200, and to his very interesting discussion attention is now called as well as to the full-page illustration drawn by Mr. C. E. Faxon, which prefaces the article.

In this article Mr. Fernald makes *R. strigosus* a variety of *R. Idaeus*, and our American red raspberry by his disposition becomes *R. Idaeus* L. var. *strigosus* (Michx.) Fernald. It is not very probable that many American botanists will accept this rearrangement, though it must be admitted that some of the herbarium material from northern Europe and Siberia appears to be much like some that is found in America. He calls Mr. Eggleston's plant *R. Idaeus* var. *anomalus* Arrhenius (*R. Leesii* Babbington), an interesting round-leaved dwarf form of Europe which it resembles in some respects, especially in the shape of its leaves. But they are manifestly not the same, being quite as different as *R. Idaeus* and *R. strigosus*, and there is as much occasion for giving them distinguishing names. The European dwarf has the distinguishing characters of *R. Idaeus* while the Cavendish plant has those of *R. strigosus*. Mr. Eggleston's plant is very slender and delicate; the bark on old canes is of reddish straw-color and has a few short, rather strong prickles; the small and slender

bristles and hairs on the peduncles, pedicels, and calyx are tipped with glands. *R. Idaeus* var. *anomalus*, judging from the specimen in hand, is a stocky plant with gray bark covered with very numerous, long, straight bristles, while the petioles, peduncles, pedicels, and calyx are similarly covered with glandless bristles. It is interesting here to note that in the opinion of Mr. Fernald this absence of glands in *R. Idaeus* is the character which best distinguishes *R. Idaeus* from *R. strigosus.*

Mr. Eggleston's plant according to Mr. Fernald's general view should be treated as an intergrading variety between *R. Idaeus* var. *anomalus* and *R. Idaeus* var. *strigosus.* This would make from the four forms of red raspberries now known one species and three varieties. The writer prefers to regard *R. strigosus* as a distinct species. Mr. Eggleston's plant may be properly treated either as a variety of *R. strigosus* or as a distinct species. The prevailing custom among American botanists is to make so distinct a plant a species and it is here so treated. The European dwarf has been so considered. This gives us four species; *R. Idaeus* L., *R. Leesii* Babbington, *R. strigosus* Michx. and

Rubus Egglestonii sp. nov.

Allied to *R. strigosus* Michx., the bark, prickles, flowers, and fruit being very similar; plants glandular, dwarfish, about one foot high; leaves small, rounded, coarsely crenate-dentate, one to one and one-half inches broad, trifoliolate with rounded, sessile leaflets on new canes and varying from unlobed to deeply lobed on old canes; inflorescence very scant, consisting of two- to four-flowered slender racemes.

Type collected by Mr. W. W. Eggleston in Cavendish, Vermont, June 9, 1900.

It is possible that this is a mere sport but not at all probable, and botanists may well be watching for it in other places, especially far to the north where it may reasonably be expected to be not rare.

OBSERVATIONS ON THE FORMATION OF ALGAL PAPER

By John W. Harshberger

A few years ago my attention was called to a felted mass of material collected in several places in eastern Pennsylvania on the margins of ponds, lakes, and reservoirs, as well as on Lake Champlain. A microscopic study of this material showed me that it comprised the matted remains of green algae and diatoms that had been blown together by the wind, and later dried, so as to form sheets of paper. The notes below give the results of my investigation.

Samples of pond paper were submitted to me by Dr. G. F. Gilbert, of Honey Brook, Pa., where it was formed in the reservoir of that place, and by Miss Elizabeth Woolman, of Lansdowne, Pa. The paper from Honey Brook was formed by the matting together of oak leaves, some pretty well decomposed, others dry, brown and firm, and matted filaments of *Oedegonium* sp., with numerous detached oögonia and oöspores, *Diatoma vulgaris*, *Bumilleria* sp., *Tabellaria floccosa*, *Tribonema bombycinum*, *T. bombycinum* forma *minus* and *Euastrum simplex*.

The felt submitted by Miss Woolman (now Mrs. Aldrich Pennock) was much finer in texture and more uniform in appearance. It consisted of an almost pure mass of the filaments of *Oedegonium fragile*. None of the filaments of this mass were in the fruiting condition, nor were the cells so badly collapsed.

An asbestos-like felt was received from Dr. Charles H. Frazer from W. C. Richardson, collected at Essex, Lake Champlain, in June, 1904. This asbestos-like felt was found to consist of frustules of a *Navicula*, the species of which I have been unable to determine. In addition to *Navicula*, I found a few disjointed segments of *Tabellaria floccosa*, together with a few filaments of an undetermined alga which assisted in the formation of the felted mass.

Through the courtesy of Dr. Adolph W. Miller, I received some algal felt from Dr. H. M. Freas, of Philadelphia, gathered

by him in Gustine Lake, Fairmount Park. Upon examination, this proved to consist of almost pure felted masses of *Tribonema bombycinum*.

Having determined the plants which enter into the composition of the algal paper mentioned above, it is important to describe the method of its formation. All of the forms of algae mentioned above are free-floating kinds ordinarily described as freshwater plankton. When floating on the surface, such plants are driven about by the wind that blows over the surface of the lake or pond. Smaller masses of floating algae are blown together until large mats are formed, in which dead leaves and other material may be incorporated, and these mats may be blown to the shore and anchored by drifting into shallow water. If such rafts of material occur in a reservoir, as at Honey Brook, the drawing off of the water would cause the stranding of the rafts. The water held in suspension in the interstices of the filaments evaporates and the cells dry up and extensive sheets of algal paper are thus formed. In the case of algal rafts stranded on the shores of ponds and lakes, the advent of hot weather and the lowering of the general level of the water by evaporation would cause in a similar manner the formation of the algal paper, or felt.

The composition of this paper depends on the algae which are present in the pond when the formation of the paper begins. The paper may consist entirely of one plant, as in the diatomaceous and oedogonial papers, or in a mixture of a number of diverse types of green algae with diatomaceous frustules and the remains of leaves blown into the pond from bordering forest trees.

UNIVERSITY OF PENNSYLVANIA.

SHORTER NOTES

THE TAXONOMY OF A LEAF-SPOT FUNGUS OF THE APPLE AND OTHER FRUIT-TREES. — The "brown-spot" disease of apple leaves was doubtfully attributed to the fungus *Phyllosticta pirina* Sacc. by Alwood * in 1892. The same fungus occurs on the leaves of pear, quince, and plum, and the disease is known by the name of "leaf-spot," "frog-eye," etc.

* Alwood, W. B. Va. Agr. Exp. Sta. Bull. 17 : 62. 1892.

An examination of a considerable number of specimens of the fungus on apple and quince leaves shows that the spores in the more mature pycnidia are not "hyaline," as originally described by Saccardo,* nor "slightly smoky," as described by Martin † and by Ellis and Everhart ‡, but considerably smoky, even approaching olive-brown, the depth of color depending upon the maturity of the spores. There is a possibility that the descriptions referred to were made from immature specimens.

I have been able to obtain artificial cultures of the fungus readily. In the cultures, the spores ooze out of the pycnidia in dull black masses. The culture work is being continued and inoculations are being made by Mr. Carl P. Hartley, whose results will be published later.

The color of the mature spores is more like the color of the spores of a *Coniothyrium* than a *Phyllosticta*, and *Coniothyrium tirolense* Bubák,§ occurring on pear leaves, may be only a mature *Phyllosticta pirina* Sacc. I have not had an opportunity to compare specimens of the two fungi.

On account of the color of the spores as they have been found on the leaves and as they develop in artificial cultures, together with the general character of the pycnidia, it seems advisable to transfer the fungus from the genus *Phyllosticta* to the genus *Coniothyrium*, and the name **Coniothyrium pirina** (Sacc.) (= *Phyllosticta pirina* Sacc. Michelia **1**: 134. 1878) is proposed.

Acknowledgments are due to Mrs. Flora W. Patterson, mycologist of the United States Department of Agriculture, and to Professor P. A. Saccardo, to whom specimens of the fungus on apple and quince leaves were submitted for determination and comparison with type specimens of *Phyllosticta pirina* Sacc.

JOHN L. SHELDON.

WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION,
MORGANTOWN, W. VA.

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* Saccardo, P. A. Michelia **1**: 134. 1878. Syll. Fung. **3**: 7. 1884.

† Martin, George. Journ. Mycol. **2**: 17. 1886.

‡ Ellis, J. B., & Everhart, B. M. The North American Phyllostictas, 36. 1900.

§ Bubák, Fr. Oesterr. Bot. Zeitschr. **54**: 183. 1904. Saccardo, Syll. Fung. **18**: 309. 1906.

The Range of Vaccinium virgatum. — For the last two or three years I have been endeavoring to secure more complete specimens of the different species and forms of blueberries and huckleberries occurring in New Jersey than are usually to be found in herbaria. With this end in view I have marked quite a number of shrubs in different localities, and from them have secured as complete material as possible, my aim being to obtain from the same plant flowers, fruit and both young and mature foliage. Several peculiar forms have been met with and some of the species show an unusual amount of variation. Such forms and variations are now being studied as opportunity offers, but one of the discoveries growing out of the collecting is so interesting that I now wish to call attention to it.

The interesting discovery referred to is that *Vaccinium virgatum* Ait., which has heretofore been known only from Virginia and southward, is rather common in the pine-barren region of New Jersey. I have specimens from several localities around South Amboy as well as from Tom's River, and there are incomplete specimens from the latter place in the herbarium of the New York Botanical Garden, as also from Staten Island.

In general aspect the plant has much the appearance of a gigantic *Vaccinium pennsylvanicum* Lam., the strongly serrulate leaves and greenish warty branches markedly resembling those of that species. However, its true relationship is with the exceedingly variable *Vaccinium corymbosum* L. From this the strongly serrulate leaves quickly distinguish it. Dr. Small's recently described *Vaccinium simulatum* cannot be confused at flowering time, as it has a short corolla like *Vaccinium vacillans* Kalm, while our plant has a long corolla like *V. corymbosum.* Dr. Small's species seems, too, to be more a plant of the mountains, and *V. virgatum* to be more a plant of the lowlands. Fruiting specimens of the two species are, however, separated from one another with difficulty.

The New Jersey form like the southern form develops the earlier flowers (which are usually but little tinged with rose) before the leaves, but many of the flowers remain until after the leaves are nearly fully grown. The pubescence of the young

leaves is not strongly developed, but nevertheless persists on the lower surface of the mature leaves, especially on the veins. The fruit is abundant and resembles in size that of *V. corymbosum.* In color, however, it is much more variable, ranging from dark-blue with a little bloom to blackish with no bloom, thus showing a very similar variation to that exhibited by the common huckleberry [*Gaylussacia baccata* (Wang.) K. Koch].

Judging from the original description of *V. virgatum* by Aiton (Hort. Kew. **2**: 12) written in 1789, the plant intended to to be named cannot be told with any certainty, but in Watson's Dendrologia Britannica (*pl. 33*) there is a good plate of the plant cultivated in Great Britain under that name — evidently the same species to which the name is applied in America. The extension of its range northward into New Jersey and New York is, of course, not at all surprising when one considers the large number of southern forms with a similar range.

KENNETH K. MACKENZIE.

EAST ORANGE, NEW JERSEY.

REVIEWS

Kraemer's Text-book of Botany and Pharmacognosy*

This book is intended for the use of students of pharmacy, as a handbook for food and drug analysis and as a work of reference. It appears as a second edition of a former work of Professor Kraemer's, published in 1902, even though that had a slightly different title, and the subject-matter has been so changed and extended that it might well be issued as an independent work. The first edition was a small octavo book of less than 400 pages, with 17 plates inserted at the close of the text, and with practically no discussion of botanical theory. The present volume is a larger octavo of over 800 pages, with 321 figures dispersed through the text, and over one fourth of the discussion is devoted to pure botany.

* Kraemer, Henry. A Text-book of Botany and Pharmacognosy. 8vo. vi + 840. *f. 1–321.* Second revised and enlarged edition. J. B. Lippincott Company, Philadelphia and London. 1907. $5.00 *net.*

The first three chapters deal respectively with the great groups of plants (three being recognized, *i. e.*, Thallophytes, Archegoniates and Spermophytes), the outer morphology of Angiospermae, and the inner morphology of higher plants. The selection of the material presented in this portion of the work has been made with care, and we believe that it establishes a standard decidedly in advance of the work that is generally being pursued in the colleges of pharmacy. Certain parts of the discussion will appeal to the botanist as formal and artificial. Such considerations, however, are a necessity to the pharmacist, who is often dealing with the mechanical features and mathematical measurements of plant structures in his analyses. The author has been obliged, perhaps of necessity, to content himself with the presentation of these facts, which are piled up in great detail. It appears to us that certain portions might have been shortened in order to give place to a fuller discussion of the relationship of the great groups of plants, the significance of morphological characters, and the forces operative in shaping them.

Chapter IV., dealing with the classification of angiosperms yielding drugs, and chapter V., on the cultivation of medicinal plants, are entirely new and of very general interest. In the classification of angiosperms the author gives a concise description of the plants yielding drugs and other useful products, as well as the non-official drugs derived from them. This portion of the work will be of service to the botanist and pharmacist alike. The orders and families of the Angiospermae are briefly characterized in the sequence of Engler and Prantl and the various medicinal plants are discussed under their respective families. In many cases no attempt apparently has been made to distinguish between the various orders and families, and probably this is the only practical course where the main consideration is the character of the plant rather than the diagnostic features of the groups, which are, in many cases, at present poorly understood. Much interesting information is presented in the discussion of the cultivation of medicinal plants, attention being called to the growing scarcity of many of the officinal plants and to the opportunity for the profitable cultivation as well as to

the improvement of the drug products by cultural conditions. Approximately 190 species are now cultivated in the United States while 178 species are growing wild, and in addition to this number probably 50 or 75 species from Europe and other countries might be profitably cultivated.

Part II. — Pharmacognosy — dealing with crude drugs and powdered drugs and food, consists of extended and greatly improved presentations of the same subjects as in the older edition. The attention attracted to this part of the work and especially the elaboration of keys for the identification of the crude and powdered drugs has already been noticed in Torreya. It need only be added that the treatment has been greatly improved by the addition of numerous illustrations, and, in the chapter on drugs and foods, drawings and descriptions of the histological elements and contents of over 200 foods, spices, and drugs are given.

The work closes with a chapter on the various classes of reagents and on the technique involved in sectioning and mounting of specimens.

Carlton C. Curtis.

Cook's Aspects of Kinetic Evolution*

The method by which the present order of things in the universe has been brought about is a problem whose solution has challenged the philosophically inclined from the time of the early Greeks and earlier to the present day. Among the various hypotheses that have been proposed may be mentioned the following:

I. *Special creation.* God made things; *i. e.*, we do not know how the present order came about. The question is not a proper one for scientific inquiry. (Cuvier, Agassiz.)

II. *Evolution.* The present order came about as the result of a series of gradual changes. The changes by which the present order of living things resulted constitute organic evolution. Theories of organic evolution have been either *static*, regarding the organism as changing only when acted upon from without; or *kinetic*, regarding the organism as changing spontaneously.

* Cook, O. F. Aspects of Kinetic Evolution. Proc. Wash. Acad. Sci. 8: 197–403. 1907. Washington, D. C. Published by the Academy.

The theories may be grouped as pre-Darwinian, Darwinian and post-Darwinian.

(*a*) Pre-Darwinian. (Chiefly static.)

1. The environment (many of the factors of which are known) directly causes organisms to change. (Lamarck, de Maillet, Nägeli, and others.)

2. The inheritance of the effects of use and disuse is a causal factor in the change. (Lamarck, Spencer.)

(*b*) Darwinian. (Partly static.)

The changes of variation (however caused) are of the kind known as continuous. Certain of these changes are perpetuated by natural, *i. e.*, environmental, selection. The fittest only survive. (Darwin, Wallace.) There have been several modifications of Darwinism as originally proposed by Darwin. Darwin, and especially Huxley, recognized the fact that variations might be spontaneous (kinetic).

(*c*) Post-Darwinian.

1. The variations of evolutionary significance are spontaneous (kinetic), and discontinuous (mutations). One method of evolutionary advance is by the operation of natural selection on mutations. Hybridization is also a factor. (De Vries.)

2. The variations involved in evolution are continuous and spontaneous (kinetic), resulting entirely from interbreeding (*symbasis*). Natural selection is not a factor in evolution. (O. F. Cook.)

This last hypothesis is most fully elaborated in "Aspects of Kinetic Evolution." According to the author, "The kinetic theory of evolution finds in the facts of organic development indications that the characters of species change spontaneously, or without environmental causation (p. 197), and holds "that evolution arises from the association of organisms into interbreeding groups, or species" (p. 290).

Evolution, "the process of change by which the members of an organic group become different from their predecessors, or from other groups of common origin" (p. 277), differs from speciation, or "the attainment of differential characters by segregated groups of organisms, that is, by subdivision of older species (p.

278). "Symbasis is the normal evolutionary condition of free and extended interbreeding among the individual members of natural species" (p. 277).

The above quotations indicate what, in the mind of the author of the hypothesis, is the essential difference between this hypothesis and its predecessors. The reader is "duly warned" (p. 295) that "kinetic evolution does not come as an amendment to natural selection," for "selection is not merely inadequate as the cause of evolution; it is not an evolutionary cause at all, in the concrete physiological sense."

In harmony with the theory, it is most important to distinguish:

Heterism — "the diversity of individuals inside the species" (p. 318).

Evolution — the process of change of type through the assemblage of variations by inbreeding (*symbasis*). Symbasis may not cause variation (p. 318), but it is the cause, *par excellence*, of evolution.

Speciation — "The attainment of differential characters by segregated groups of organisms" (p. 278). "Evolution depends upon symbasis, speciation upon isolation" (p. 278).

Incidentally, in this connection, it seems pertinent to inquire how, since there is no "law of heredity," * can variations be assembled, since they would not be transmitted from parent to offspring.

The mere proposal of a theory of evolution, purporting to be diametrically opposed to all preceding theories, and whose acceptance implies the total rejection of the latter as not only inadequate but misleading and fundamentally false, is not only a bold claim, but it at once challenges the closest examination and comparison and the most rigid criticism.

In a careful reading of the book, one is impressed with the conspicuous absence (with few exceptions) of definite citations in referring to the literature dealing with other theories, and of an entire disregard, in some instances, of other work that has a direct bearing upon the theory proposed as new. For example,

* Cook, O. F., & Swingle, W. T. Evolution of Cellular Structures. Bull. Bureau Plant Industry, 81: 9. 1905.

in denying (p. 222) "any directly causal connection between evolution and environment," there seems to be no recognition of the fact that environment may operate directly upon the germ-cells and cause variations, which, as MacDougal has experimentally shown, are undoubtedly inherited. Again, in discussing "Differences in Growth-stages" (p. 237), no mention is made of Diels' recent and very pertinent work on "*Jungendformen und Blütenreife im Pflanzenreich.*" Also no reference is made to Blaringhem's work on the inheritance of the effect of injuries, which surely has a bearing on environment as a causal factor.

One wonders if "Diversity of Normal Descent (Heterism)" p. 244, *et seq.*) is offered as an original idea. Such seems clearly to be the implication, and yet memory persists in recalling Bailey's "The Survival of the Unlike," * and his "Cross-breeding and Hybridizing" (p. 5), to which no reference is made, and the older "Bathmism" of Cope, and, to go still further back, the clear statement of the idea by Herbert Spencer.†

Here and there throughout the book the term "evolution" seems to be used as synonymous with "organic evolution"; *e. g.*, "Evolution is a name for the process of gradual change by which the diversity of organic nature has come about" (p. 284). So, also, on page 277, quoted above. Furthermore, there seems to be a redefinition of old terms, and then the employment of these terms as newly defined when discussing Cookism, but as previously defined when referring to other theories. For example, on page 314, isolation, considered a factor in (organic) evolution (old definition), is rejected as a factor in evolution (new definition, *i. e.*, variation through symbasis). From this the *non sequiter* is inferred that the theories are wide apart.

In referring to de Vries's theory of mutation, it is stated that "Professor de Vries argues, in some of his writings, that mutations are due to environmental causes," yet no reference is made to the following statement of de Vries: "The variability of species is independent of environment. In my experiments the mother species mutates in all directions. . . . The mutation

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* See, *e. g.*, pp. 20, 25, and 53 of that work.

† Principles of Biology 2: 329. 1900.

therefore is independent of environment, its direction is not governed by circumstances."* Or, in "Species and Varieties" (p. 696), "the ordinary external conditions do not necessarily have an influence on specific evolution."

If the statement (p. 322) that, "The evolution is in the species, the power of deflection in the environment," by contrast with the quotation on the same page from de Vries that "By this means natural selection" (said, in the same paragraph, to be "not a force of nature, no direct cause of improvement") "is the one directing cause of the broad lines of evolution," is meant to point out a difference in the two theories, the close propinquity of the two sentences seems quite unfortunate.

Possibly, also, the statement that, according to de Vries, new characters, in order to be preserved, must be environmentally useful (p. 281), would not have been written if notice had been taken of de Vries's declaration that, "Harmless or even slightly useless ones (mutations) have been seen to maintain themselves in the field during the seventeen years of my research . . . ." And on page 281, the cart and horse are surely reversed, when it is stated that, according to de Vries, "new species have to be made, in order to originate and preserve new characters."

If evolution, "represents the working of no special . . . . mechanism" (p. 323), it is difficult to understand how "The final and ultimate explanation of evolution must await an understanding of the constitution of living matter" (p. 323), or what the positions of "granules derived from a given ancestor" have to do with evolution. We cannot escape mechanisms by writing atoms and molecules, or granules, instead of chromosomes.

De Vries is said (p. 362) to "especially insist" on the tenet that the idea of species is "founded on identity of form and structure," and is quoted six lines below as saying that "purely uniform species seem to be relatively rare." If the term species is used in each of these cases with the same meaning, the discrepancy between the interpretation and the quotation is quite evident, and even more so when we recall de Vries's statements in "Species and Varieties," that, in species, "All sorts of variability occur, and no individual or small group of specimens can really be considered

* De Vries, Hugo. Science, II. 15: 727. 1902.

as a reliable representative of the supposed type" (p. 37). "We may conclude that systematic species, as they are accepted nowadays, are as a rule compound groups" (p. 38). These quotations can hardly be interpreted as an insistence upon the dictionary definition of a systematic species.

Anyone who holds that the term species cannot be given a definition acceptable to all systematists has returned to a "mediaeval" type of reasoning (p. 362), and taxonomists may now choose from arropic, ropic, subsexual, semisexual, sexual, supersexual, symbasic, porric, stenic, linic, and clonic species (p. 389 *et seq.*).

Typographical errors are rare, but on p. 234 it seems that "*intra*spective" should be read "*intra*specific."

The lack of qualitative variations in such species as, *e. g.*, *Liriodendron Tulipifera*, or in species of the diatoms, which have persisted unchanged through many geological epochs, and the coexistence of closely related species without isolation, environmental or physiological, are some of the problems which seem more difficult of solution on the basis of "kinetic evolution" than otherwise.

Emphasis upon the idea of kinetic variation in organic evolution is a distinct service, and the idea is of increasing interest in the light of the recent revelations of physical chemistry, pointing strongly to the evolution of the chemical elements by spontaneous transformations, that is, by a kinetic inorganic evolution. The volume, however, does not refer to this closely related phenomenon, and kinesis is discussed only with reference to the realm of the organic.

C. Stuart Gager.

PROCEEDINGS OF THE CLUB

May 29, 1907.

The Club met at the museum building of the New York Botanical Garden at 3:30 o'clock, with an attendance of twenty.

Dr. John Hendley Barnhart was called to the chair.

After the reading and approval of the minutes of the meeting of May 14th, the following scientific program was presented:

"*The Linnaean and other early-known species of Crataegus,*" by Mr. W. W. Eggleston.

The earliest record found of American *Crataegi* is by Caspar Bauhin, in 1623. It is as follows :

"*Mespilus virginiana colore rutilo. Mespilus, qui colore est rutilo ut cerasa & valde dulcis*, part I, Ind. occid."

The latter part of this quotation probably refers to the Historia Medicinal, by Monardes, published in 1569.

Lists of plants raised in the botanical garden at Leiden, published by Hermann in 1687, by Boerhaave in 1720, and by Royen in 1740, and in the Schola Botanica published at Paris in 1687, as well as Linnaeus's own lists (Hort. Cliffortianus and Hort. Upsaliensis), give short references to American Crataegi ; but it is to the English botanist Plukenet that we owe our first real knowledge of American thorns. His plates and descriptions are referred to by Linnaeus, and these, with his references, are invaluable to us.

Contemporary with Plukenet was Ray, who also added somewhat to our knowledge. John Banister of Jamestown or Williamsburg, Va., must have contributed much to Plukenet's knowledge, as he was the first English botanist to live in Virginia, and as he sent many seeds and specimens to England.

This Chesapeake Bay region produced all of the Linnaean species, except the one that has been referred to as *C. tomentosa*. This might have been brought from farther back in the country, perhaps by the Indians, as it was one of the earliest thorns raised in England, and is not found in the coastal plain.

In Plukenet's Phytographia, published in 1591, are five figures of American Crataegi ; Plukenet says that he saw the species illustrated in his plate 46, fig. 1, in the garden of the Hon. Charles Howard in Surrey. This specimen Linnaeus refers to *Crataegus Crus-galli*. A colored plate of it is published in the "List of Plants raised for sale by the English Gardeners about London" (Hort. Brit.), published in 1730. This is the plant labelled in the Linnaean herbarium as *C. tomentosa*. About this Miller was undoubtedly right, for Plukenet's description will cover no other American thorn, certainly none other that was raised in England at that time.

Plukenet's fig. 2, plate 46, undoubtedly refers to *C. Phaenopyrum* (Linn. f.). There is a good plate of this in Hort. Brit. Linnaeus referred this plate to *Crataegus coccinea*, and it has long been incorrectly referred to as *C. cordata* (Miller).

Plukenet's fig. 4, plate 46, is the first figure referred by Linnaeus to *Crataegus coccinea*. This figure and description require a smooth thorn with broad, slightly lobed leaves, and a red, two-seeded fruit. The only known American thorn that fits this description is *C. Margaretta* Ashe (= *C. Brownii* Britton). This was not known from the coastal-plain region, but there is a specimen in the U. S. National Museum from Maryland. Fig. 5, of plate 99, is a young shoot of *Crataegus Crus-galli* L.

Plate 100, fig. 1, was referred by Linnaeus to *Crataegus tomentosa*. This is the same as *Crataegus uniflora* Muench., or *C. parvifolia* Aiton. It is a common coastal-plain species, which both Banister and Clayton must have collected in Virginia. Clayton mentions but one species with leaves hairy on the lower side, and the reference is doubtless to this species.

That Linnaeus did not know well the thorns he was describing is partially proved by his referring *C. Phaenopyrum*, a five-seeded species, to a two-seeded species. Miller's description of the *Crataegi* raised in England is invaluable to us in tracing out these Linnaean species. As Miller says, Linnaeus was doubtless misled by Kalm.

Crataegus viridis L. was collected and probably described by Clayton. About this species there can be no question for there is a Clayton specimen of *C. viridis* in the British Museum.

A colored plate was made by Ehret for *Plantae Selectae* beween 1750 and 1762. This may be the first illustration of *Crataegus flava* Aiton. It certainly belongs to the *flavae*, and was raised from seed sent from Carolina by Catesby in 1724. Another American thorn, *C. punctata*, was illustrated by Jacquin in Hort. Vind. 1770.

"*Further Remarks on the Botanical Exploration of the Bahamas*," by Dr. N. L. Britton:

Referring to a previous communication made to the Club and to others, printed in the *Journal of the New York Botanical Gar-*

den. Dr. Britton gave an account of the recent expeditions of Mr. L. J. K. Brace to Crooked Island, Acklin's Island, Long Cay (Fortune Island), and Andros, and of his own trip in February and March, in company with Dr. C. F. Millspaugh, to Eleuthera, Little San Salvador, Cat Island, Conception Island, Watling's Island, and Long Island. During the progress of this trip, Mrs. Britton explored the northern part of Eleuthera and did some collecting on New Providence. The greater portion of the archipelago has now been visited through the coöperation of the Field Museum of Natural History with the New York Botanical Garden, but the extreme southeastern islands, including Atwood Cay (Samana), Mariguana, and the Caicos Islands are as yet botanically unknown, and the central portion of the large island of Andros is a *terra incognita*. The small islands on the Cay Sal bank also remain unvisited. Dr. Britton exhibited specimens of many of the characteristic species and remarked on their distribution.

The Club adjourned until October 8, 1907.

C. Stuart Gager,
Secretary.

NEWS ITEMS

Professor Charles E. Bessey will again be acting chancellor of the University of Nebraska for the four months this summer and autumn during which Chancellor E. Benjamin Andrews will be on leave of absence in Europe.

Professor William Trelease, who has held the chair of botany in Washington University at St. Louis since 1885, was among those who received the degree of LL.D. at the recent commencement commemorating the fiftieth anniversary of the founding of that university.

It is stated in the *Botanical Gazette* that Dr. A. F. Blakeslee of Harvard University has been elected professor of botany in the Connecticut Agricultural College at Storrs, and that he will begin his duties the present year by acting as director of the summer school.

Mr. Charles Louis Pollard, recently botanical editor for the G.

& C. Merriam Company of Springfield, Mass., has been appointed curator of the Staten Island Association of Arts and Sciences, New Brighton, New York. The collections belonging to the Association are now stored in temporary quarters pending their removal to the new Richmond Borough Building, in which the museum is to be located.

Sir Dietrich Brandis, for many years inspector-general of forests to the government of India, died at Bonn, Germany, May 28, in the eighty-fourth year of his age. In addition to numerous reports on forestry matters, Brandis published in 1874 a work on the "Forest Flora of North-west and Central India" and in 1906 a large descriptive volume on "Indian Trees." In connection with his great work as "father of systematic forest management in the British Empire," he is credited with having had much influence in the establishment of an efficient forestry service in the United States.

Dr. Maxwell T. Masters, for more than forty years connected in an editorial capacity with the *Gardeners' Chronicle*, died at his home in Ealing, a suburb of London, on May 30. Dr. Masters' botanical interests were broad. Besides his numerous writings on topics relating to horticulture and gardening, he was the author of a standard work on "Vegetable Teratology," of "Botany for Beginners," of several papers on the taxonomy and morphology of the Coniferae, was editor of the second, third, and fourth editions of Henfrey's "Elementary Course of Botany," and was contributor of special parts to Martius' "Flora Brasiliensis" and to other important floras.

Vol. 7 No. 8.

TORREYA

August, 1907

THE GENUS PILOSELLA IN NORTH AMERICA

By P. A. Rydberg

PILOSELLA (Thal) Kostel. Enum. Hort. Prag. 104. 1844.
Arabidopsis (DC.) Schur. Enum. Pl. Trans. 55. 1866.
Stenophragma Celak. [Fl. Prager Umgeg. 1870] Flora **55**: 438. 1872.

Prantl in Engler & Prantl, Pflanzenfamilien, adopted Celakowsky's genus *Stenophragma* for *Arabis Thaliana* L. and its relatives. There are, however, two older generic names available. Neither of these has been included in Harms's list of *genera excludenda* and they must be considered, whether one follows the American or the Vienna Code. The first of these was published by Kosteletsky in 1844. Kosteletsky not only gives the binomial *Pilosella Thaliana* but states in a footnote that it has been included in *Arabis* and *Sisymbrium* by authors. Furthermore, he credits the name *Pilosella* to Thal, by placing the name of the latter in parenthesis after the name *Pilosella*. *Pilosella siliquata minor* was described and figured by Thal in 1588 and it was the plant on which Linnaeus based his *Arabis Thaliana*. There is therefore no uncertainty about the identity of Kosteletsky's genus *Pilosella*. Some botanists require that a diagnosis (some even insist that this should be in Latin) should accompany a generic name in order to constitute publication, but such a requirement is always at least pedantic and in many cases simply ridiculous. In this case the identity of the genus *Pilosella* (then a monotype) is well established, and the plant was described and figured by Thal and described by Linnaeus.

It is true that the name *Pilosella* has been used for a part of genus *Hieracium*, but according to the American and the Vienna

[No. 7, Vol. 7, of Torreya, comprising pages 133–156, was issued July 19, 1907.]

codes it was not published as a genus in this sense until 1862, when it was published by the two brothers, Schultz of Zweibrücken.* Twelve years before that time (in 1850), F. W. Schultz had published a few binomials under the generic name *Pilosella*, but only as synonyms under species which he still retained in *Hieracium*. The earliest use of the name *Pilosella* for a group of *Hieracium* seems to be in 1542 by Fuchs. It was used in that sense by Dodoens, Camerarius, Caspar Bauhin, etc., and by Ruppius as late as 1745, but I have been unable to find it used as a genus after 1753 and before 1844. Should this, however, be the case, *Arabidopsis* Schur should be used for *Arabis Thaliana* instead of *Stenophragma*. When Schur established *Arabidopsis*, he not only cited *Arabis Thaliana* L., *Conringia Thaliana* Reich. and *Sisymbrium Thalianum* Gay, but stated that the genus was equivalent to De Candolle's *Sisymbrium* sect. VII., *Arabidopsis*. The writer cannot see why these two names should be ignored and the later *Stenophragma* be adopted. The following species of PILOSELLA are found in North America :

PILOSELLA THALIANA (L.) Kostel. Enum. Hort. Prag. 104. 1844.
Arabis Thaliana L. Sp. Pl. **2** : 665. 1753.
Conringia Thaliana Reichenb. Ic. Fl. Germ. **2** : *pl. 60*.
Stenophragma Thalianum Celak. Flora **55** : 442. 1872.
Arabis parviflora Raf. Am. Mo. Mag. 1 : 43. 1817.

A species introduced from Europe, and sparingly established from Massachusetts to Georgia and Kansas ; collected also in Utah.

Pilosella Novae-Angliae Rydb.

Arabis petraea Hook. Fl. Bor.-Am. **1** : 42, in small part. 1829. T. & G. Flora 1 : 80, mainly. 1838. Not *Arabis petraea* (L.) Lam. 1783.

Sisymbrium humile Wats. & Coult. ; A. Gray, Man. Ed. 6 : 71. 1890. Not *Sisymbrium humile* Ledeb. 1830.

Braya humilis Robinson, Syn. Fl. $\mathbf{1}^1$: 141, in part. 1895.

This plant seems to have been included in Hooker's *Arabis petraea*, but here evidently confused with *Arabis lyrata* Nutt. and

* Flora **45** : 417. 1862.

A. ambiguus DC. The first time it was really distinguished was in Torrey & Gray's Flora; but here the range is faulty, probably because these authors followed Hooker in this respect, and Dr. Pitcher's specimen belongs to *Arabis lyrata*. A somewhat better description we find in Gray's Manual, sixth edition, and in the Synoptical Flora; but in both it is confused with the Rocky Mountain plant, *i. e.*, the species which we next discuss. The first adequate description we find in Britton & Brown's Illustrated Flora,* where it is also figured. This description, as well as that in Britton's Manual, refers wholly to the eastern plant, but Alaska and Oregon should be excluded from the range.

Pilosella Novae-Angliae differs from *Sisymbrium humile* Ledeb. (Icon. Pl. Fl. Ross. **2**: 16. *pl. 147*. 1830) in the more compact habit, the scant pubescence, the smaller flowers, the more slender pod, and the longer style, which is about 1 mm. long.

Dr. Robinson refers the plant to *Braya*, but the type of that genus is so unlike this species both in habit and structure that the present writer can not follow him in his views. *Pilosella Novae-Angliae* has such a resemblance to *P. Thaliana* in many respects that it would be hard to deny the relationship. The structure of the pod is the same, the only difference being that the minute reticulation of the septum in *P. Novae-Angliae* is shorter and therefore approaches that of *Braya*. In habit, the main difference between the two species is that *P. Thaliana* is an annual, while the present species is a perennial.

The specimens at hand of *P. Novae-Angliae* are the following from Willoughby Mountain, Vt.: July, 1887, *Edwin Faxon* †; 1894, *A. J. Grout, W. W. Eggleston, & H. S. Jesup*; 1892, *H. H. Rusby*; 1866, *H. Mann*; 1881, *C. G. Pringle*.

Pilosella Richardsonii Rydb.

Sisymbrium humile (especially var. β) Hook. Fl. Bor.-Am. **1**: 62. 1830. Not *Sisymbrium humile* Ledeb. 1830.

Braya humilis Robinson, Syn. Fl. **1**[1]: 141, in part. 1895.

This also has been confused with *Sisymbrium humile* Ledeb.

* 2: 116. *f. 1698*. 1897.

† As no type has been designated under any of the synonyms given above, this may be regarded as the type; it is preserved in the Columbia University herbarium.

and is nearer to it in general habit, but differs in the thicker leaves (usually deeply dentate), dense and very short pubescence, thicker and more torulose pod. These characters, together with the larger flowers, very short style, which is scarcely more than 0.5 mm. long, and the stems, decumbent at the base, distinguish it from the preceding species. The following specimens are at hand: Sandy Plains, Lower Bow Park, vicinity of Banff, Alberta, 1890, *McCalla 2272*; Banff, 1887, *J. Fowler*; about Mackenzie River, from lat. 60° to 68°, *Richardson*. Emerald Lake, Alberta, 1904, *J. Macoun 64433* and *C. H. Shaw 109*.

Pilosella virgata (Nutt.) Rydb.

Sisymbrium virgatum Nutt.; T. & G. Fl. **1**: 93. 1838.
Stenophragma virgatum Greene, Pittonia **3**: 138. 1896.
Arabis Brebneriana A. Nelson, Bull. Torrey Club **25**: 373. 1898.

The first one to transfer this species to a genus with *Arabis Thaliana* L. as the type was Dr. Greene. He was not, however, the first one who saw the relationship between these two species, for in Torrey & Gray's Flora they are associated with *S. humile*, *S. glaucum* Nutt. and *S. pauciflorum* Nutt. in a section Arabidopsis. Except the last one, which is doubtful and unknown to the writer, the group comprises just those species which the writer here regards as constituting in North America the genus *Pilosella*. The more he studies the work of Thomas Nuttall, who contributed most to the knowledge of these species as well as numerous others to Torrey & Gray's Flora, the more he admires that old botanist's acuteness. In ability to recognize relationships, he surpassed even Dr. Torrey and Dr. Gray.

The most extended description of this species was made by Professor Aven Nelson under the name of *Arabis Brebneriana*. The only discrepancy we find is that the valves of the pod are said to be "obscurely few-nerved," for besides the few obscure nerves there is in each a prominent midrib, making the pod angular just as in *Pilosella Thaliana*. The only difference in the structure of the pod is that the septum of the pod has a faint midrib, which is obsolete in *P. Thaliana*, *P. Novae-Angliae*, and

P. Richardsonii. Professor Nelson has later recognized the fact that *Arabis Brebneriana* is not an *Arabis.* He then distributed it as *Streptanthus*. Professor Nelson is easily excusable for having redescribed *Sisymbrium virgatum* under another name, for the more common plant known under that name is not Nuttall's plant, but an undescribed closely related species, which is diagnosed below. The only specimens of the true *P. virgata* seen by the writer are the following: Rocky Mountains, near the sources of Sweet Water, *Nuttall*; Colorado, *Hall & Harbour*; Wyoming, Fort Steele, 1897, *Aven Nelson 3135*; Laramie, 1899, *Aven & Elias Nelson 6827.**

Pilosella stenocarpa Rydb.

Biennial or perhaps a short-lived perennial; stem hirsute with branched hairs, usually simple up to the inflorescence; basal leaves oblanceolate, 2–3 cm. long, sinuate-dentate, short-petioled, hirsute-stellate; stem-leaves sagittate, sessile, about 2 cm. long; sepals oblong, about 2 mm. long; petals spatulate, 3 mm. long; fruiting pedicels 5–10 mm. long, ascending; pod 2.5–4 cm. long, glabrous, scarcely 1 mm. wide; beak about 0.5 mm. long.

This closely resembles the preceding in habit, but differs in the smaller flowers, narrower pod, and more distinct style. It is usually also more simple. In *P. virgata* the petals are usually 4 mm. long, the pod 2 mm. thick, and the style obsolete. A duplicate of Nuttall's *Sisymbrium virgatum* is in the Columbia University herbarium and it matches closely *Arabis Brebneriana* Nelson. The following specimens of *P. stenocarpa* have been seen: Wood Mountain, Assiniboia, 1895, *John Macoun 10007* (type, in Columbia University herbarium); Pole Creek, Wyoming, 1895, *Aven Nelson 1334*; Tie Siding, Wyo., 1896, *Osterhout*; Leucite, Wyo., 1901, *Merrill & Wilcox 480*; McCoys, Colo., 1903, *Osterhout 2763*.

Pilosella glauca (Nutt.) Rydb.

Sisymbrium glaucum Nutt.; T. & G. Fl. **1**: 93. 1838.
(?) *Turritis diffusa* Hook. Fl. Bor.-Am. **1**: 41. 1829.

* *Aven Nelson 1299* and *1902* may also belong here, but the fruit is too little developed for determination.

Sisymbrium salsugineum S. Wats. Bibl. Ind. 70. 1878. Not *Sisymbrium salsugineum* Pall. 1773.
Thelypodium salsugineum Robinson, Syn. Fl. 1^1: 175. 1895.

Dr. Robinson referred this species to *Thelypodium*, but it lacks the most characteristic feature of that genus, *i. e.*, the sagittate and curved anthers. The flower and pod are almost exactly like those of *P. Thaliana*. Prantl * refers the closely related *Sisymbrium salsugineum* Pall. to *Stenophragma* and the writer thinks rightly so. He thinks, however, that the American plant is distinct from the Siberian, having smaller flowers and entire instead of coarsely toothed basal leaves. The only characters in which they do not agree with the typical *Pilosellae* are but trifling ones, viz: the lack of pubescence and the clasping stem-leaves.

A key to these species may here be added:

Stem-leaves not auriculate-clasping or sagittate at the base.
- Annual. — *P. Thaliana.*
- Perennial.
  - Stems erect; leaves thin, sparingly pubescent; style about 1 mm. long. — *P. Novae-Angliae.*
  - Stems decumbent at the base; leaves thick, densely stellate; style about 0.5 mm. long. — *P. Richardsonii.*

Stem-leaves auriculate-clasping or sagittate at the base.
- Plants pubescent, biennial or perennial.
  - Pod 2 mm. thick; style obsolete. — *P. virgata.*
  - Pod about 1 mm. thick; style 0.5 mm. long. — *P. stenocarpa.*
- Plant glabrous, annual. — *P. glauca.*

New York Botanical Garden.

THE MUSEUM AND LIBRARY OF THE STATEN ISLAND ASSOCIATION OF ARTS AND SCIENCES

By Charles Louis Pollard, *Curator*

The books and collections belonging to the Staten Island Association of Arts and Sciences were moved on July 9 from the Staten Island Academy, where they had been stored for the last ten years, to Room 309 in the Richmond Borough Building, which was assigned to the Association last November by the Commissioners of the Sinking Fund. This room, occupying

* Engl. & Prantl, Nat. Pflanzenfam. 3^2: 192. 1891.

most of the northern frontage on the third floor of the building, is well adapted for museum purposes. It is about 25 by 150 feet, with five large windows situated in shallow alcoves. Admission is gained through three separate entrances from the corridor. The wall-space, except on the north side, is occupied by a row of bookcases five feet in height; these and the rest of the woodwork are of weathered oak in dull finish. The west half of the room, separated by a temporary partition, is now used by draughtsmen attached to the city engineer's office; it is understood, however, that other quarters will be found for these by the time the museum furniture is ready. A partition will then probably be erected at the eastern end, creating a room of sufficient size for administrative purposes and for the accommodation of the herbarium and other collections not on public exhibition.

In botanical material the Association has already an excellent nucleus. Its herbarium, numbering about 3,000 specimens, consists chiefly of local plants, including most of the material, original or in duplicate, on which Britton and Hollick's "Flora of Richmond County" with its subsequent additions, was based. To this will be added as soon as formally turned over to the Association the herbarium of Dr. Arthur Hollick, containing about the same number of specimens, many of them from other parts of the United States. The local material will ultimately be brought together as a separate herbarium, which with the recent collections made on the island by Dr. Philip Dowell and others will afford a very complete representation of the Staten Island Flora, accessible to all students. For exhibition purposes there is already available a good series of nuts, acorns, and other large fruits from Staten Island trees; specimens of bracket fungi; a number of stems showing various forms of fasciation; a few wood specimens; and an excellent series of fossil plants and plant remains. It is planned also to exhibit a collection of the seaweeds of New York harbor, mounted in swinging or in wall frames; series of seeds of native grasses, weeds, etc.; and later, model groups illustrating the ecological features of our flora.

The library of the Association at present includes about two thousand volumes, principally serials received in exchange for

its Proceedings. Among the more valuable complete sets may be mentioned the Bulletin of the Torrey Botanical Club, Science, the American Naturalist, the Report of the Missouri Botanical Garden, the Annals of the New York Academy of Sciences, the Bulletin of the American Museum of Natural History, the Reports of the Smithsonian Institution and of the U. S. Geological Survey, etc. Many of these are not to be found elsewhere on Staten Island.

The library has recently been enriched by a donation of 150 miscellaneous scientific books from Dr. Arthur Hollick, and will also receive as a deposit about the same number of volumes from the library of the curator.

THE BOTANICAL SYMPOSIUM, AT NEWTON, NEW JERSEY

The fourth annual Botanical Symposium was held, as previously announced in TORREYA, at Newton, Sussex County, New Jersey, during the week of July 1–7, 1907, with headquarters at the Hotel Waldmere. Beside a few local visitors, there were twenty-five in attendance.

Monday, July 1.— Most of the party arrived on the afternoon of the first day and had time for a short walk in the immediate vicinity, so that at the first meeting, held in the evening, several interesting finds were reported. Limestone ridges running northeast and southwest through the region of Newton afford conditions favorable to the growth of some interesting plants. Among these were noted *Arabis laevigata* (Muhl.) Poir., *Quercus acuminata* (Michx.) Houba, *Asplenium platyneuron* (L.) Oakes, *A. Ruta-muraria* L., *A. Trichomanes* L., *Camptosorus rhizophyllus* (L.) Link, *Filix fragilis* (L.) Underw., *Pellaea atropurpurea* (L.) Link, and *Woodsia obtusa* (Spreng.) Torr. In the swampy ground there were *Alnus incana* (L.) Willd., *Betula pumila* L., *Equisetum fluviatile* L., and *Moehringia lateriflora* (L.) Fenzl. The following were noted as weeds: *Anthemis arvensis* L. (common), *Lepidium apetalum* Willd., *Pentstemon Digitalis* (Sweet) Nutt. (abundant), and *Scrophularia leporella* Bicknell. *Malva*

moschata L. was noted as an escape. Dr. Philip Dowell presided at the evening meeting, which was devoted largely to the reading of the report of the previous year's Symposium, at Mountain Lodge in the Adirondacks, and to various business items. At the request of the permanent recorder, Mr. Joseph Crawford, the report was read by Mr. Lee Sowden. A program committee, consisting of Messrs. Stewardson Brown and B. W. Griffiths, was appointed to plan the excursions and to make the necessary arrangements for each day's trip. Messrs. Lee Sowden and S. Van Pelt were appointed official recorders of the finds reported by members of the Symposium from the vicinity of Newton. Mrs. H. A. DeCoster and Mr. Bayard Long were appointed official photographers.

Tuesday, July 2. — Some of the hill country east and the chain of lakes northeast of Andover Junction were visited. Mr. Brown presided in the evening. The following are some of the plants noted: *Anchistea virginica* (L.) Presl, *Botrychium simplex* E. Hitchcock, *Woodsia Ilvensis* (L.) R. Br., *Achroanthes monophylla* (L.) Greene, *Galeorchis spectabilis* (L.) Rydb., *Leptorchis liliifolia* (L.) Kuntze, *L. Loeselii* (L.) MacM., *Capnoides sempervirens* (L.) Borck., *Pyrola secunda* L., *Ranunculus delphinifolius* Torr., from the hill country east; and from the lake region, *Adlumia fungosa* (Ait.) Greene, *Astragalus carolinianus* L., *Carex Buxbaumii* Wahl., *C. conoidea* Schk., *C. flava* L., *C. granularis* Muhl., *C. lanuginosa* Michx., *C. leptalea* Wahl., *C. longirostris* Torr., *C. riparia* Curtis, *C. tetanica* Schk., *Cornus circinata* L'Her., *C. stolonifera* Michx., *Geum rivale* L., *G. strictum* Ait., *Naumburgia thyrsiflora* (L.) Duby, *Parnassia caroliniana* Michx., *Polygonum amphibium* L.

Wednesday, July 3. — The excursion was to Culver's Lake and Culver's Gap, about twelve or thirteen miles north and west of Newton. Especially interesting was the flora of the mountain at the Gap. Dr. N. L. Britton was chairman at the evening meeting. The following are some of the interesting plants reported from the mountain: *Amelanchier spicata* (Lam.) Dec., *Apocynum Milleri* Britton, *Aralia hispida* Vent., *Azalea canescens* Michx., *Castilleja coccinea* (L.) Spreng., *Polygala polygama* Walt.,

Prunus cuneata Raf., *P. pennsylvanica* L. f., *Ranunculus fascicularis* Muhl. (?), *Sorbus americana* Marsh., *Viburnum pubescens* (Ait.) Pursh. Among other plants noted on the way and in the region about the lake are *Acer spicatum* Lam., *Asclepias verticillata* L., *Blephariglottis grandiflora* (Bigel.) Rydb., *Botrychium neglectum* A. Wood, *Calla palustris* L., *Panicularia Torreyana* (Spreng.) Merr., *Rubus neglectus* Peck, *Salix tristis* Ait., *Utricularia vulgaris* L., *Viola blanda* Willd., *V. Porteriana* Pollard, *V. rotundifolia* Michx. Dr. Britton and others commented on the similarity between the flora of this mountain and other mountains in the region, and comparison was made with the xerophytic vegetation of sandy regions nearer the coast.

Thursday, July 4. — In the morning the region southwest of town was examined, some going beyond Springdale. In the afternoon most of the party visited a tamarack swamp a short distance north. Dr. G. N. Best presided at the evening session, when a number of interesting finds were reported: *Acer nigrum* Michx., *Arabis hirsuta* (L.) Scop., *Arisaema pusillum* (Peck) Nash, *Asplenium ebenoides* R. R. Scott (2 plants beyond Springdale), *Carex cephalophora* Muhl., *C. filiformis* L., *C. laxiflora blanda* (Dewey) Boott, *C. oligocarpa* Schk., *C. xanthocarpa* Bicknell, *Coeloglossum bracteatum* (Willd.) Parl., *Corallorhiza multiflora* Nutt., *Crataegus Porteri* Britton, *Cypripedium hirsutum* Mill., *C. parviflorum* Salisb., *C. reginae* Walt., *Dryopteris Clintoniana* (D. C. Eaton) Dowell, *D. Goldieana* (Hook.) A. Gray, a new *Dryopteris*, two species of *Dudleya*, *Erysimum cheiranthoides* L., *Fraxinus nigra* Marsh., *Hypopitys lanuginosa* (Michx.) Nutt., *Limodorum tuberosum* L., *Lysias Hookeriana* (A. Gray) Rydb., *Meibomia grandiflora* (Walt.) Kuntze, *Melanthium latifolium* Desr., *Mentha aquatica* L., *Menyanthes trifoliata* L., *Myrica Gale* L., *Orontium aquaticum* L., *Picea Mariana* (Mill.) B. S. P., *Pogonia ophioglossoides* (L.) Ker, *Rubus americanus* (Pers.) Britton, *Rumex Britannica* L., *Salix Bebbiana* Sarg., *S. candida* Fluegge, *S. petiolaris* J. E. Smith, *Sarracenia purpurea* L., *Utricularia cornuta* Michx., *U. intermedia* Hayne. An interesting discussion occurred on mutants in connection with *Arisaema pusillum*, in which Dr. Britton, Mr. Brown, Dr. Ida Kellar, and others took part.

Friday, July 5. — The day was spent on a trip to Swartswood Lake. Mr. Joel Carter presided at the evening session. Among the plants reported may be noted the following: *Batrachium longirostre* (Godr.) F. Schultz, *Boltonia asteroides* (L.) L'Hér., *Botrychium neglectum* A. Wood, *Carex setifolia* (Dewey) Britton, *Celtis georgiana* Small, *Conopholis americana* (L. f.) Wallr., *Cypripedium hirsutum* Mill., *Galeorchis spectabilis* (L.) Rydb., *Phegopteris Phegopteris* (L.) Underw., *Salix prinoides* Pursh, *Taraxacum erythrospermum* Andrz. Dr. Britton reported *Polygala paucifolia* Willd., showing good fruit, both aërial and subterranean, also one tree of *Diospyros virginiana* L. and a peculiar form of *Ilex verticillata* (L.) A. Gray (?). The terrestrial form of *Ranunculus delphinifolius* Torr. was observed on the muddy border of a pond.

It is interesting to note the finding of the persimmon in this latitude, and it may be of interest to add that during several years of botanizing around Allentown, Pa., I found just one tree of this plant, and that along the roadside in a similar situation to the one noted by Dr. Britton.

Saturday, July 6. — The day was spent in an all day trip to Round Pond, some thirteen miles west of Newton. This lake is at a considerable elevation, and it was expected that the mountain about the lake would prove to be very interesting botanical ground, as indeed it was. Owing to the time required for traveling by team, however, only a comparatively short time could be devoted to exploration. The higher parts of the mountain were covered with a dense undergrowth. Considerable swampy ground, however, yielded some interesting finds, among which were noted: *Acer carolinianum* Walt., *Achroanthes unifolia* (Michx.) Raf., *Anchistea virginica* (L.) Presl, *Betula alleghaniensis* Britton, *Carex trisperma* Dewey, *Castalia odorata* L. (small form), *Coptis trifolia* (L.) Salisb., *Cornus canadensis* L., a short-leaved form of *Gaylussacia baccata* (Wang.) K. Koch, *Gymnadeniopsis clavellata* (Michx.) Rydb., *Ilex bronxensis* Britton, *I. laevigata* (Pursh) A. Gray, *I. verticillata cyclophylla* Robinson, *Ilicioides mucronata* (L.) Britton, *Kalmia angustifolia* L. and *K. glauca* Ait. (side by side), *Limnanthemum lacunosum* (Vent.) Griseb., *Limodorum tuberosum*

L., *Lobelia Dortmanna* L., *Perularia flava* (L.) Rydb., *Pogonia ophioglossoides* (L.) Ker, *Rhodora canadensis* L., and *Salix sericea* Marsh.

Mr. S. Van Pelt presided over this last meeting, which practically ended the Symposium.

Some of the members had left already and others intended to leave on the following day. Several stayed over until Monday and a few stayed several days longer. Those who remained explored the region about Newton more fully. Among the interesting finds not previously noted are these: *Andromeda Polifolia* L. and *Carex limosa* L. found by Mr. Van Pelt, *Rhamnus alnifolia* L'Hér. by Mr. Long, *Triglochin maritima* L. by Dr. Elsie Kupfer, *Trollius laxus* Salisb. by Prof. C. S. Williamson, *Dryopteris Boottii* (Tuckerm.) Underw., *D. cristata* × *marginalis* Dav., and *Filix bulbifera* (L.) Underw. by the writer.

A great many interesting finds are yet in store for the botanist who has the opportunity of spending more time about Newton, where nature is still quite undisturbed in many places. This applies perhaps as well in the case of the zoölogist, as the many fearless chipmunks and numerous birds and other wild animals testify. Most of us were too much intent upon noting the plants to make records of the wild animals seen, except in the case of the birds. These were noted by Mrs. H. A. DeCoster, who made a list of them.

It is expected that the next Symposium will be held at Townsend, Delaware, or somewhere on the Delaware peninsula.

PHILIP DOWELL.*

REVIEWS

Jost's Lectures on Plant Physiology

The anxiously awaited English edition† of Jost's Vorlesungen über Pflanzenphysiologie has appeared. That Professor Gibson has done admirably as a translator is certain. As the preface ex-

* I am indebted to the recorder, Mr. Joseph Crawford, for many of the data given.

† Jost, Ludwig. Lectures on Plant Physiology. Authorized English translation by R. J. Harvey Gibson. 8vo. Pp. i–xiv + 1–564. *f. 1–172.* 1907. Oxford, at the Clarendon Press. Cloth, 21 s., net; half morocco, 24 s., net.

plains, no attempt to "edit" the original has been made and no responsibility is assumed for the treatment of subjects. While this attitude of the translator shows deference to the author it is to be regretted that a work of this character, which will undoubtedly be standard for some time to come, could not have been edited enough at least to avoid the continuance of confusing terminology, some of which was noted by reviewers when the German edition appeared.

In some cases the translator has unfortunately selected words which are not physiologically precise and for which a good equivalent could be used without departing from close translation. For instance, "Stoffaufnahme" is interpreted as "absorption" all through the work. Plants do not absorb substances, they admit them. Admission is certainly as nearly equivalent as "absorption." "Wasserabgabe" is translated "excretion of water," which is physiologically incorrect and inaccurate as translation. In the absence of an exact equivalent, why not use the term, exit of water, when the general passage of water from the plant is intended? Likewise, "Wasseraufnahme" could be translated, admission of water, instead of the absorption of water. The term suction is frequently used instead of the proper usage, negative pressure.

That the translator has exercised commendable discrimination in some cases is apparent in his interpretation of the word "Verwendung." Utilization or appropriation are more nearly equivalent than the word "fate," which the translator has used. Cells do not use nor do they appropriate admitted substances, though material which enters the cell does have a "fate." The same discrimination applied to the phrase, "Verwendung der aufgenommenen Stoffe" would yield "the fate of admitted substances."

Perhaps the most unfortunate confusion of terms and ideas is apparent in the persistent use of assimilation to express the synthesis of complex compounds and the word dissimilation to express the reverse process. When the German edition appeared, Professor Barnes, in his review of the work, called attention to the impropriety of the usage. In an explanatory paragraph on page 103 of this English edition the original author himself con-

cedes the justice of the criticism but offers a rather lame excuse for continuing the usage. Nitrogen assimilation of Jost could easily be the synthesis of nitrogenous compounds ; photosynthesis is already restricted to carbohydrate construction in which light energy is needed and by no means covers other syntheses of carbohydrates in which light is not a factor. As Jost says, there is no good reason for treating nitrogen differently from carbon, but there is no more necessity for that than for perpetuating improper terminology "with full cognizance of the difficulties involved in so doing."

To each lecture, as indicated by brackets, there have been added by Jost himself paragraph comments on later work and references to recent literature, so that the English edition is more up to date than the original and those accustomed to always using the German should remember this as well as the fact that Jost himself has made some alterations and corrections.

The typographical work conforms to the standard of the Clarendon Press though the lines are a little too close together.

While the reviewer feels that some of the matters here discussed are important he is equally earnest in saying that the translator deserves abundant credit for the valuable service he has rendered in extending the field of usefulness of such an important work.

RAYMOND H. POND.

Hilgard's Soils*

Dr. Hilgard is undoubtedly the leading authority on soils in America, having studied them critically for over fifty years, under almost every climatic condition that is found in the United States, and at all stages of economic development from primeval forests and deserts to truck-farms and gardens. The volume before us contains the essence of all his previous publications on the subject, and covers the ground very thoroughly, revealing his exten-

* Hilgard, E. W. Soils : their formation, properties, composition, and relations to climate and plant growth in the humid and arid regions. xxvii + 593 pp. 89 figs. New York, Macmillan Co. 1906. (On the back of the title-page is a statement that the book was published in July ; but the publishers apparently did not begin to advertise it in their own periodical, Science, until September 28, and it was first announced in the New York Times Saturday Review of Books about the same time.)

sive knowledge of meteorology, physics, chemistry, geology, botany, and sociology, and their intimate relations to the main topic. At the same time it is written in a simple and attractive style, and is as free as possible from technicalities. The type, paper, and binding are well chosen, and typographical errors are few.

The main body of the book, exclusive of the very full table of contents, the preface, introduction, three appendices, and two indexes, is divided into four parts, 26 chapters, and 549 pages, including 89 figures, many of which are half-tones. It has already been reviewed appreciatively and at considerable length by a soil expert,* and the present reviewer does not feel qualified to add anything to what has been said about the first three parts, which treat of the origin, physics, and chemistry of soils. Part 4, entitled "Soils and Native Vegetation," which contains brief repetitions of some of the essential features of the three preceding parts, together with much additional matter, will interest botanists most, though the rest of the book contains many botanical references and is well worth studying.

The study of the relations between soil and vegetation has always been one of Dr. Hilgard's specialties. He points out here the difficulty of reaching correct conclusions on this subject in Europe, where most of the soils were cultivated and fertilized for generations before botany became a science, and deplores the scarcity of accurate observations in America, where the character of the original vegetation is known by tradition nearly everywhere where it does not still exist. His view, as expressed in the preface and two or three other places in the book, as well as in some earlier publications, is that "the native vegetation represents, within the climatic limits of the regional flora, the result of a secular process of adaptation of plants to climates and soils, by natural selection and the survival of the fittest. The natural floras and sylvas are thus the expression of secular, or rather millennial experience, which if rightly interpreted must convey to the cultivator of the soil the same information that otherwise he must acquire by long and costly personal experience." In this

* F. H. King in Science II. **24**: 681–684. 30 N 1906.

field of research Dr. Hilgard modestly credits Owen and Peter with being the pioneers in this country, but his own splendid "Report on the Geology and Agriculture of Mississippi" (printed in 1860, but unfortunately not generally distributed until several years later *) is far ahead of anything previously published in that line. It is undoubtedly the first work in which the floristic differences between the several longitudinal subdivisions of the coastal plain † are clearly pointed out, and it remains to the present day the most complete description of the vegetation (as well as of the geology) of Mississippi ever published.‡

In the new book, as in some of his previous publications, the author lays stress upon the principle that in regions of ample rainfall, like the Eastern United States, variation in the amount of lime in the soil is one of the chief causes of local diversity of vegetation; while in arid regions, where nearly all soils are calcareous, the effect of moisture is more conspicuous. This perhaps explains why most of the studies of the relations between geology and vegetation hitherto made in this country have been in the East, while ecologists living on the Plains are inclined to regard water-content of the soil as all-important.

The first chapter of part 4 is practically a condensation and revision of the author's observations in Mississippi previously published in the 1860 report just mentioned and in the fifth volume of the Tenth Census twenty-four years later. Regarding vegetation as essentially stationary, he points out the striking differences between the natural growths on calcareous and non-

* See Am. Jour. Sci. II. 32: 303. 1861; Tenth Census U. S. 5: 67, 201. 1884; Am. Geol. 27: 284–311. 1901; Bull. U. S. Geol. Surv. 283: 5, 6. 1906.

† In this connection it is noteworthy that the term "coastal plain" did not appear in strictly botanical literature until ten or twelve years ago, and even yet many American botanists do not realize its significance, and still more probably regard that province as essentially a homogeneous one.

‡ It was under his leadership that the two splendid volumes on cotton production of the southern states and California were prepared for the Tenth Census. On account of their too modest title these volumes have never received the recognition from scientists (except perhaps from geologists) that they deserve; but they are remarkable for their accuracy and completeness, and show in a most convincing manner how the local distribution of forests, crops, and population in the Southeast depends mainly on soil, rather than on temperature, latitute, altitude, or drainage basins, as some writers in the North have assumed.

calcareous, clayey and sandy, sour and neutral soils, etc. Instead of ambiguous statements that certain soils are characterized by "pines," "oaks," "bays," "gums," and the like, such as one commonly finds in soil-survey reports and other publications of similar nature, Dr. Hilgard mentions particular species, not only of trees but smaller plants, and in several cases different forms of the same species.*

A significant point which he makes (p. 495) is that the "calcifuge" plants of pine meadows have as a rule very small seeds. It would be interesting to determine how far this correlation holds with bog-plants in other parts of the world, and with plants of other habitats.

The second chapter of part 4 deals with the relations of soils to vegetation in other states of the Union and in Europe, as observed by the author and a few others who have given attention to the same problems. The statement on page 518 that "*Aster Novae-Angliae* serves as a reliable guide to high-class lands in the Middle West," when it is well known that this same handsome and easily recognizable species is a common roadside and pasture weed in the washed gravelly soils of New England, is interesting. Has this species perhaps come into New England from the West in historic times, as many other weeds have done, or are the

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* It is indeed difficult (though perhaps not impossible, as some would have us believe) to draw a sharp line between variations which are due directly and solely to differences in environment, and distinct species which cannot be merged into each other. Dr. Hilgard places in the former class a few pairs of species which were not distinguished by botanists at the time he knew them in the field, but have since stood the test of cultivation side by side, and have been proved distinct by the discovery of additional characters, as well as by their respective ranges. Such pairs are *Pinus palustris* and *P. Elliottii* (p. 494), *Taxodium distichum* and *T. imbricarium* (p. 494), and probably *Quercus Phellos* and *Q. laurifolia* (pp. 502, 507). It is scarcely necessary to add that most modern species-makers are inclined to err in the other direction.

The different forms of post-oaks and black-jacks figured on pages 500 and 501 are indeed remarkable; and without having seen the originals it would be hazardous to express any opinion on them. The post-oak (*Quercus minor*) has been split up by recent writers into three or four supposed distinct species, some of which may correspond with some of Dr. Hilgard's figures; but no subspecies or varieties seem to be recorded for the black-jack (*Quercus marylandica*), which Dr. Hilgard finds equally variable. Further study of these forms in the field would be interesting.

eastern and western plants different species? Or is this a problem for the ecologist rather than for the systematist?

In discussing some of the phytogeographical phenomena of Europe Dr. Hilgard comments on the physical and chemical theories of soil influences, and the classification of plants as "calciphile," "calcifuge," "silicophile," etc., and reviews the work of Thurmann, Fliche, Grandeau, Bonnier, Contejean, A. F. W. Schimper, Wahlenberg, and others. He also emphasizes the great predominance of calcareous soils in Europe as compared with America, a fact which is often overlooked by ecologists and agricultural scientists when making use of European literature. Another important point is that the definition of calcareous soils differs considerably in the two continents. In Europe a soil is not usually called calcareous unless it effervesces with acids, which requires 4 or 5 per cent. of calcium carbonate, while in the United States many soils bearing characteristic "lime vegetation" contain less than 1 per cent. of the same mineral.

The last chapter, on the vegetation of saline and alkali lands, is based on some of the author's latest work in California. It contains illustrations of several of the characteristic alkali plants, with some anatomical and physiological notes, and statistics of the maximum, minimum, and optimum amounts of the various alkalies in the soil for each species.

The three short appendices deal with simple methods of soil examination. The subject index is as complete as could be reasonably desired, and in place of a regular bibliography there is an index of the names of authors whose works are referred to in the text.* Among about 185 such names botanists will be interested to see those of Coville, Darwin, Haberlandt, Kearney, Kuntze, Mohr, G. T. Moore, W. J. V. Osterhout, and J. W. Toumey, besides those mentioned above.

If space would permit, a great deal more might be written about this book, which must be seen to be appreciated. It will be very

* Dr. Hilgard does not attempt to list his own writings on the subject, but the following references will be instructive to the reader who wishes to become more familiar with his views: Science 11: 241, 242. 1888; Overland Monthly, D 1891; Science II. 18: 755-760. D 1903; 19: 233, 234. 5 F 1904; 20: 605-608. 4 N 1904; 23: 70, 71. 12 Ja 1906.

useful to all persons who are interested in the study of plant environments, especially to those who have not access to the author's Mississippi reports above mentioned; and it should stimulate the investigation of a branch of phytogeography which has received entirely too little attention in America.

Roland M. Harper.

NEWS ITEMS

According to a recent number of *Science*, Dr. M. A. Chrysler of Harvard University has accepted a position as associate professor of botany in the University of Maine.

Mr. Homer D. House has resigned the associate professorship of botany and bacteriology in Clemson College, South Carolina. He plans to spend the coming year at the New York Botanical Garden.

Dr. William L. Bray has resigned the professorship of botany in the University of Texas in order to accept the professorship of botany in Syracuse University, recently vacated by Dr. J. E. Kirkwood.

Dr. W. C. Coker, associate professor of botany in the University of North Carolina, spent a considerable part of July in studies at the New York Botanical Garden. He sailed from New York on August 3 for a visit to Porto Rico.

Professor F. S. Earle, recently director of the Cuban Agricultural Experiment Station, has been at the New York Botanical Garden for several weeks, continuing his studies of the gill-fungi. He sailed from New York for Cuba on August 10.

Dr. E. N. Transeau, who for the past year has been an investigator at the Carnegie Station for Experimental Evolution at Cold Spring Harbor, Long Island, N. Y., has accepted an appointment as professor of botany in the State Normal School at Charleston, Illinois.

Miss Winfred J. Robinson, instructor in botany in Vassar College, has a year's leave of absence, which she will devote to studies at the New York Botanical Garden. Miss Helen L. Pal-

liser will have charge of the botanical courses in Vassar during the coming year.

We note with regret the death of a former member of the Club, Mr. Samuel Henshaw, which occurred at West New Brighton, Staten Island, on July 22. Mr. Henshaw was head gardener of the New York Botanical Garden from the beginning of its active development in 1896 to 1901.

Mr. Edward W. Berry, of the Johns Hopkins University, is spending two months in a field study of the Mesozoic deposits of Virginia, North Carolina, and South Carolina. Important plant-bearing beds have already been discovered in several localities in North Carolina and in one locality in South Carolina.

The thirteenth annual field meeting of the Vermont Botanical Club was held in Pownal, Vermont, July 2 and 3, 1907. About forty persons were in attendance, including several members of the Connecticut Botanical Club. Tuesday, July 2, was devoted to exploring the limestone cliffs at North Pownal, under the guidance of Mr. W. W. Eggleston, while Wednesday, the 3d, was spent in visiting the bogs of the central and eastern parts of the town, Miss Grace Greylock Niles, author of "Bog-trotting for Orchids," acting as guide.

Professor Francis E. Lloyd, formerly of the Teachers College, Columbia University, and more recently connected with the Desert Botanical Laboratory of the Carnegie Institution, has accepted a position as botanical expert with the Continental Rubber Company of America, which owns very extensive tracts of land in central Mexico and has its headquarters in New York City. Dr. J. E. Kirkwood has resigned his professorship of botany in Syracuse University in order to assist Professor Lloyd in this new work, which they have already begun. The main plant of the company is located at Torreon, State of Coahuila, and it is understood that the "guayule," a composite of the genus *Parthenium*, is the source of the rubber obtained. The present address of Professors Lloyd and Kirkwood is Hacienda de Cedros, Mazapil, Zacatecas, Mexico.

Vol. 7 No. 9.

TORREYA

September, 1907

THE DATES OF RAFINESQUE'S NEW FLORA AND FLORA TELLURIANA

By John Hendley Barnhart

As far as I am aware, no question has ever been raised concerning the reliability of the dates given on the title-pages of any of the works of Rafinesque. His Autikon Botanikon, to be sure, is dated 1815–1840, while no portion of the text was published until 1840; but this text was intended to illustrate an herbarium which the author had accumulated during the years 1815–1840, so that the meaning of the date he gives is manifest.

About a year ago I noticed in the Flora Telluriana (**4**: 27) a brief criticism of Gray's monograph of the Melanthaceae of North America, which was not published until November, 1837;* and this, of course, showed that Rafinesque's criticism could not have been published earlier than that date. A hurried examination revealed further internal evidence of the erroneous dating of the Flora Telluriana and its companion-work, the New Flora of North America, but the investigation of the subject was not carried very far at that time.

When the last number of the North American Flora was in press, it became necessary for Dr. Small to decide upon the relative priority of *Mesynium* Raf. ("1836") and *Cathartolinum* Reichenb. (1837), and this led to the study of which the results are here reported.

The New Flora of North America was undertaken by Rafinesque as a supplement to the works previously published by others upon the same topic; and as a result of his labors upon

* Gray, A. Melanthacearum Americae Septentrionalis Revisio. Ann. Lyc. Nat. Hist. N. Y. **4**: 105–140. N 1837.

[No. 8, Vol. 7, of Torreya, comprising pages 157–176, was issued August 21, 1907.]

it, he was led to undertake the preparation of its "sequel," the Flora Telluriana, dealing with the plants of the rest of the world. The pages of these two works contain many descriptions of "new genera" of plants, so that the dates of their appearance are of considerable importance. As the books themselves are quite scarce, a brief preliminary account of them may not be out of place.

Each was planned to consist of six "parts" or volumes, but was completed in four. Each of the eight parts is separately paged, and has a separate title-page and subtitle of its own; and each is dated "1836."

NEW FLORA AND BOTANY OF NORTH AMERICA

First part. Introduction, Lexicon, Monographs. 100 pages. 1836.

Second part. Neophyton. 96 pages. 1836.

Third part. New Sylva. 96 pages. 1836.

Fourth part. Neobotanon. 112 pages. 1836. (This contained also a general title-page for the entire work, dated 1836.)

FLORA TELLURIANA

First part. Introduction and Classification. 103 pages. 1836.

Second part. Centuria I, II, III, IV. 112 pages. 1836.

Third part. Centuries V, VI, VII, VIII. 100 pages. 1836.

Fourth part. Centuries IX, X, XI, XII. 135 pages. 1836. (This contained also a general title-page for the entire work dated 1836.)

Of these eight parts, the first part of the New Flora was the first to appear. It contained a dedication dated at Philadelphia, September, 1836; and pages 73–80 are occupied by a monograph of the genus *Kuhnia*, dated October, 1836. These facts alone are sufficient to make one suspect that perhaps the eight parts were not all issued before the end of that year! There is not lacking other internal evidence on this subject, in addition to the citation of Gray's monograph (Fl. Tell. **4**: 27; also New Fl. **4**: 103, where the date of "Grey's" paper is distinctly stated as "1837"). Flora Telluriana, part 3 (which in turn is cited by

New Fl. 3 : 41, 51), on page 57 refers to Bot. Reg. *pl. 1906* (1 N 1836 !); and on page 37 to Bot. Mag. *pl. 3540* (1 D 1836 !), which could not well have reached Philadelphia before the end of the year 1836. Flora Telluriana, part 4 (which in turn is cited by New Fl. 4 : 56, 57, 63, 98), on page 124 cites Bot. Reg. *pl. 1958* (1 My 1837). But, in spite of these references, I know of no *internal* evidence that the two works were not completed before the end of the year 1837.

From internal evidence, too, it is possible to arrange the parts serially, in the order in which they were printed. This may be done by means of the exact citations, by page, of one work by the other; chiefly of the Flora Telluriana by the New Flora. The result is as follows: New Fl. I; Fl. Tell. I; Fl. Tell. II; New Fl. II; Fl. Tell. III; New Fl. III; Fl. Tell. IV; New Fl. IV.

In order to approximate more closely than might otherwise be possible the exact dates of issue of each of these parts, the series of letters written to Torrey by Rafinesque during the years 1836 to 1839, and preserved in the Torrey correspondence at the New York Botanical Garden, was searched, and the search was well rewarded, as is shown by the following quotations:

September 5, 1836.—"I having leisure have resolved to begin to print my New flora of North Amer. by alphabetical order. . . . When this Work is printed, my botanical labors from 1802 to 1836, in America, will be better known."

December 21, 1836.—"My flora proceeds very slowly & was even suspended awhile for lack of a compositor that could print Botanical terms! . . . I have concluded to close the Lexicon of monographs very abruptly, and give instead selected monographs & my N. Genera & species."

This shows that only ten days before the close of the year 1836 even the printing of the first part of the New Flora was not completed.

April 18, 1837.—"I wanted to surprise you with a great Botanical Work — my Flora telluriana . . . to which I was led by my New flora of N. Amer., but I could only print 2 parts or volumes. I. Classes & Orders. 2d. 400 N. Gen. my other engagts have compelled me to suspend for a while."

By the middle of April, 1837, then, had been printed one part of the New Flora and two of the Flora Telluriana.

October 24, 1837. — "I am still going on slowly with my New flora of N. America and Flora telluriana at once. . . . I have circulated but few copies of the numbers published, wishing to surprise you and all Botanists when the whole shall be out; but if you wish to see them earlier I may send you 5 numbers of 100 pages 8vo each very soon, and more next March."

From this it appears likely that a second number of the New Flora had appeared when this letter was written, and that a third number of the Flora Telluriana was nearly ready; or else that the two parts were nearly ready to be issued together.

January 10, 1838. — "My New flora or Mantissa begun to print in 1836 is still going on & altho' interrupted by my flora Telluriana & 2 works published this Spring (1. The Universe. — 2. Safe Banking) is proceeding as fast as correct exam. can allow. I wished to issue the whole work together; but I shall be compelled to issue when half is ready 3 numbers of 100 pages as in Flora tellur. My 3d N. on the Trees and Shrubs or a New sylva is not quite ready."

At the end of 1837, then, three numbers of the Flora Telluriana had been issued, and two of the New Flora, but on January 10, 1838, the third part of the New Flora was "not quite ready."

March 20, 1838. — "I have long ago concluded 600 pages of my Supplemental Flora & Flora Telluriana or 6 parts. If I had not undertaken these 2 works together, the first would have been completed ere now, but will be ere 1840."

The third part of the New Flora had evidently been published since the date of the January letter. It appears that Rafinesque still intended each work to consist of six parts, and for this reason allowed himself until 1840 to complete them.

February 1, 1839. — "My 4th part or Volume of New flora was completed so as to give you time to go on with your flora. I also completed my Flora telluriana in 4 Vol. or 1225 articles. But immed^y after begun & have concluded last Dec^r my Synopsis of N. G. & Sp. of Trees & Shrubs of N. Amer."

From this it appears that prior to December, 1838, both the

Flora Telluriana and the New Flora had been completed. The last sentence refers to Rafinesque's Alsographia Americana, which was dated 1838, and from his own statement above was probably issued in December of that year.

The extracts from Rafinesque's letters show that few, if indeed any, copies of either the Flora Telluriana or the New Flora had been actually distributed until three parts of each had been printed (in the spring of 1838); but, as he says in the letter of October 24, 1837, "I have circulated but few copies of the numbers published," we must give him the benefit of the doubt, and assume that he had distributed a few copies.

Rafinesque's Bulletin of the Historical and Natural Sciences was an advertising sheet issued by him at irregular intervals from 1834 to 1839. No. 7, dated "Spring of 1838," is devoted chiefly to the two works here under discussion. He says in part: "I had long contemplated to give a New Flora of North America. . . . I resolved . . . to add the improvements on Natural classification. These last, however, increased so much under my revision, as to become a work by itself, and a companion rather than addition to our Flora. Both works were begun in 1836, and our plants would all have been published by this time, if I had not thus been compelled to double these botanical labors. I once proposed to issue the whole at once when completed, but this delay and others arising from different pursuits and labors, have induced me to publish the parts as soon as printed, and now that 3 parts of each (being half a volume,) are published, I issue this Bulletin to acquaint the Botanists of Europe and America with" them. "Each work is to consist of 6 parts of 100 to 120 pages, thus forming a volume large octavo of 600 to 700 pages, which shall be completed in 1840 or sooner. . . . The 6 parts now printed, 3 of each work, will be sold together for $5."

The dates of the two works under discussion, as nearly as they can be determined from the evidence here submitted, may be summarized as follows:

New Flora	Part	I.	1836 (December).
		II.	1837 (second half).
		III.	1838 (first quarter).
		IV.	1838 (late in year).

FLORA TELLURIANA. Part I. 1837 (first quarter).
II. 1837 (first quarter).
III. 1837 (November or December).
IV. 1838 (near middle of year).

NEW YORK BOTANICAL GARDEN.

DESCRIPTION OF A NEW TERTIARY FOSSIL FLOWER FROM FLORISSANT, COLORADO

BY ARTHUR HOLLICK

Among the many interesting specimens discovered by Professor Theo. D. A. Cockerell in the Tertiary plant beds at Florissant, Colorado, recently transmitted to me for critical examination, is one which represents a more or less well-preserved flower. Some of its parts are obscure or missing, but those that are preserved show the general characters of the filaments, anthers, and petals, and, to a lesser extent, those of the calyx also.

FIG. 1. Photograph of *Phenanthera petalifera*, 1½ times natural size.

It is so seldom that the delicate tissues of petals, filaments and anthers are preserved as fossils, and the known examples of any such are so few, that this specimen is of unusual interest and is worthy of description even though the description must necessarily be incomplete.

Phenanthera petalifera gen. et sp. nov.

Remains consisting of more or less dismembered parts of a small pedunculate, choripetalous flower, which may be allied either to the family Caryophyllaceae or to the order Rosales or to the Myrtales.

Calyx-tube about 4 mm. wide and 5 mm. long, urn-shaped, 4 (?)-divided above the middle, the divisions bearing spatulate appendages (?). Petals spatulate, 2–3 times longer than the divisions of the calyx-tube and alternate with them. Stamens 8,

exserted beyond the calyx, about one-half as long as the petals. Anthers relatively large, oblong-ovate, 2-lobed.

This description indicates the appearance which the remains present in this particular specimen, and it may or may not correctly describe the flower as it was originally. Where the parts are crushed together the order of superposition cannot be determined, so that the definition of the parts and their relative positions as indicated in the figures may represent merely present appearances and not the original conditions.

Apparently it was a 4-merous flower with 8 stamens, and there is an indication of what may be a portion of a style, or perhaps a broken filament, extruding from between two of the anthers.

FIG. 2. *Phenanthera petalifera*, enlarged about 7½ diameters.

The peculiar spatulate appendages which are questionably regarded as attached to the divisions of the calyx-tube, may perhaps represent the tips of these divisions and not separate organs, or they may be expanded filaments. There is one almost perfect petal, shown on the right hand side of the figures, while on the

left there is another, evidently imperfect and apparently partly superimposed upon the remains of a third one belonging to the opposite (under) side of the specimen. If a fourth one was present it is not now apparent.

New York Botanical Garden.

AN ABNORMAL LEAF IN RUMEX

By S. B. Parish.

Fig. 3. Abnormal leaf of *Rumex hymenosepalus*, about ⅓ natural size.

The accompanying figure represents an abnormal leaf of *Rumex hymenosepalus*, having two blades. The superior blade stands more vertically erect than the lower, it is shorter and more crisped, but in other respects the two are alike. Along the midrib the bases of the blades are separated by an interval of about three millimeters. Two adjacent plants were seen, each having fully half of its leaves affected in this manner, but not all to so great an extent as the one figured. On some the secondary blade was present but as a fragment, of greater or less size, or two or three separated fragments. These might occur at any point along the midrib, from its base nearly to its apex, but always of the form and size which the blade would there have presented, had it been continuous. And in every case, even when most fragmentary, the secondary blades were produced on both sides of the midrib.

It is possible to regard this teratological condition as an instance of foliar peloria. But to this view there are two objections.

The abnormal blades, or fragments of blades, appeared to have originated at the earliest stage of leaf-formation, rather than to have been outgrowths at a later period. Furthermore, a decided disarrangement of the fibrovascular bundles of the midrib suggests a different explanation. Such a condition might result from the cohesion, or rather fusion, of the midribs of two leaves, one superimposed upon the other, the blade of the uppermost being either reduced or fragmentary. But to whatever cause this malformation was due, it is probably one of infrequent occurrence, since none of a like nature is recorded by Masters.

San Bernardino, California.

SHORTER NOTES

A new Mikania from Cuba. — **Mikania alba** sp. nov. Glabrous, except the involucral bracts. Primary branches round, striate, secondary ones hexagonal, canaliculate: petioles 4–6 mm. long, slightly winged; leaf-blades coriaceous, lanceolate-ovate, obtuse at the apex, rounded or obscurely cordate at the base, 4–5.5 cm. long, 1.6–1.8 cm. broad, diminishing in the inflorescence to linear or subulate bracts, three-nerved, the nerves deeply impressed in the reticulate-rugose upper side, prominent on the lower, the margin conspicuously revolute: inflorescence bracted, paniculate, ultimately composed of opposite, widely divaricate racemes, with a terminal one; racemes with 8–24 heads; heads opposite below, alternate above, pedicelled, subtended by a subulate bractlet much exceeding the pedicel; involucral bracts oblong-lanceolate, obtuse, 5–6 mm. long, brownish at the center, becoming transparent towards the ciliate margin, as long as or slightly shorter than the corolla; pappus white, equalling the corolla or nearly so, armed with minute spinules; corolla white, tubular-campanulate, scarcely longer than the involucral bracts, with oblong-lanceolate, acute lobes, thrice shorter than the tube, or less; stamens as long as the corolla, rarely exserted, with cylindric anthers; style-branches widely divaricate, subsequently recurved-coiling, finely tuberculate: achenes glabrous.

Collected in the Sierra Maestra, at an elevation of 3,400 feet, on Jiquarito Mountain, Sevilla Estate, province of Santiago, Cuba, by the writer on September 18, 1906; *no. 516* (type), in herb. New York Botanical Garden.

From a study of the recent monograph of the West Indian species,* we find that the plants most nearly related to *Mikania alba* are evidently *M. papillosa* Klatt of Hispaniola and *M. Swartziana* Griseb. of eastern Cuba.

From the former the new plant presents marked differences in the stem, which is angled in *papillosa*, round in *alba;* in having entire, not lobed leaves as in the Hispaniola plant, and in having a reticulate-rugose instead of a nearly smooth surface as in *papillosa*. The inflorescence in *alba* is paniculate-racemose; in *papillosa*, axillary, solitary, or sometimes a simple raceme. The corolla of the new plant is white, in *papillosa* it is yellow.

The differences between *Swartziana* and *alba* are chiefly in the lanceolate-ovate, not ovate leaves. The pappus of the new plant is scarcely longer than the involucral bracts, in *Swartziana* it is conspicuously so. The corolla lobes in *alba* are thrice shorter than the tube, in *Swartziana* "lobis breviter oblongis erectis tubo toto 5–6plo brevioribus."

The new plant differs from both the older ones in having a subtending bractlet that much exceeds the pedicel.

NORMAN TAYLOR

NEW YORK BOTANICAL GARDEN.

REVIEWS

DeVries' Plant Breeding †

This work will be eagerly read by the scientific world and the general public because of the remarkable achievements of Nilsson (made public now for the first time) and also for the impartial and appreciative account of Burbank's work. No less important is the discussion of the principles that underlie plant breeding.

In 1901 Nilsson became director of a private company that had been established in 1886 for the improvement of various agricultural crops in Sweden that were slowly but manifestly de-

* Urban, I. Symbolae Antillanae seu fundamenta Florae Indiae Occidentalis. 5: 212. 1907.

† DeVries, Hugo. Plant Breeding. Comments on the experiments of Nilsson and Burbank. 8vo. vi + 360. *f. 1–114*. The Open Court Publishing Company. Chicago and London. 1907.

teriorating and so lessening the value of harvests. It soon became manifest that the German method of ameliorating a given variety of grain by multiple selection was a failure and that any success was very exceptional, in fact a mere matter of chance. Nilsson brought to the solution of the problem a full knowledge of the laws of variability and inheritance and early in his work made the remarkable discovery that each of the so-called varieties of agricultural crops was in reality made up of a great series of distinct strains or elementary species. The number of these elementary species is surprising; for example, in the common peas 500 distinct forms have been separated and each variety of the cereals is composed of several hundred forms. More remarkable still is the degree of variation among these elementary species, which far exceeded all the expectations based upon their divergencies when first selected. In fact it was found that when these elementary forms were isolated and bred that they produced offspring so divergent in morphological characters and qualities as to meet practically any demand that the farmers required. Some were suitable for light soils, others for heavy; some were early and others late in ripening. They differed in stiffness of culms, length of ears, size and number of grains, etc. This discovery revolutionizes the common method of plant breeding. All success depends upon the initial selection of a pure strain. Manifestly the old multiple selection must result in the association of several strains — some being poor or indifferent — with the result that the offspring will be a mixture and fall short of a high standard. These early experiments demonstrated that the plant develops according to its inherent nature and that it can not be made to conform to a desired pattern. So the old idea of ameliorating a crop by repeated selections must be abandoned. A single initial selection is the important point.

Not less important from a practical standpoint was the work of Nilsson in studying the relation or correlation between the botanical characters of the elementary species and their agricultural qualities. No sooner was it discovered that the elementary species are so divergent as to meet almost any demand of the breeder than the need of a system was felt whereby the desired

quality could be recognized by external characters. This led to an elaborate study of all the traits and qualities of numerous crops with the result that slowly a system has been established for many of the grains, peas, vetches, etc., by which definite qualities can be recognized from a study of their morphological characters. The results of this work in the rapid improvement of crops can scarcely be estimated. Success is now obtained in a few years with a directness and certainty that was impossible by the old method after twenty years of work.

Naturally de Vries makes full use of this work in fortifying his mutation theory, and it will be conceded that his present discussion comes nearer to placing his theory upon an incontrovertible basis than do any of his other writings. It would appear that in order to establish his thesis it now remains for him to show only that the continuous variations of his mutants do not overlap those of the parents.

While much that is misleading has been published about Burbank, sufficiently accurate statements have been made to render his achievements familiar to all. Even his most misguided friends will recognize the scientific and appreciative consideration that is given to Burbank's work. Burbank is an idealist. While interested in the scientific aspects of horticulture he is primarily desirous of giving to his fellow men better foods and fruits and more attractive flowers, and in the cheapest form in order to dispense their enjoyment as widely as possible. No better measure of the man could be given than his dream of a spineless cactus that by its adaptability to arid regions and its edible qualities would make possible the doubling of the population of the world.

Burbank's work is prosecuted on lines quite distinct from those of the Swedish company. He is little concerned with the improvement of a race or elementary species. His results are largely gained by hybridizing. In this work he is guided by two principles that are not generally tried by other breeders. He does not rely upon the association of a few qualities in his hybrids, but all the desirable traits possible are added at once for the purpose of producing a chaos of forms from which valuable selections may be made. Thus in the California lily, *Lilium pardali-*

num, many of the known lilies of the world have contributed their peculiarities to the enrichment of the native form. Secondly, Burbank makes a study of the characteristics and qualities of his plants in all stages of their development, and this knowledge enables him to introduce promising traits and secure more desirable and direct results than other breeders.

It is popularly believed that these improved forms are new creations. Hybridizing only introduces a new combination of characters. No new ones are added. Every novelty has its basis in some previously existing form. Thus, his stoneless prune was derived from a worthless French variety, *prune sans noyau*, by adding this trait to a cultivated form.

Mention only can be made of other important features of the book. An excellent résumé of the mutation theory is presented in the introduction and a very important chapter to American farmers appears in the discussion of the methods that should be followed in corn breeding. With a crop yielding last year 2700 million bushels, valued at over a billion dollars, it will come with something of surprise to learn that little in the way of systematic breeding was attempted until ten years ago; and we infer that the best work remains to be undertaken.

The closing chapter on the geographical distribution of plants contains several discussions that will be taken with reservations by many. As especially timely may be mentioned his characterization of many of the speculations upon adaptations as merely "poetical descriptions of the way in which we should like to understand and admire nature, but not facts capable of direct proof." In this connection we cannot refrain from mentioning with some amusement (and we are sure Professor deVries will join us) that even the most careful may fall into errors of this nature, as when the author refers to plants maintaining a position of safety on the mountain tops through "dread of their enemies in the valley," (p. 340) and to plants "seeking conditions" (p. 335).

The work of Nilsson and his colaborers has heretofore been almost entirely concealed from the public owing to the fact that the aim of the company has been neither educational nor directed primarily to scientific researches. Its sole object has been the

amelioration of agricultural crops. In presenting this scientific discussion of plant breeding, Professor deVries has given us one of the most valuable contributions to botanical science in recent years.

CARLTON C. CURTIS.

COLUMBIA UNIVERSITY.

NEWS ITEMS

Dr. Heinrich Hasselbring, assistant in botany in the University of Chicago, has been appointed assistant botanist at the Cuban Agricultural Experiment Station, at Santiago de las Vegas.

Dr. C. B. Robinson, assistant curator, New York Botanical Garden, spent two or three weeks of his summer vacation in making collections at the Bay of Seven Islands, Saguenay, Quebec.

Mr. Elmer D. Merrill, botanist of the Bureau of Science of the Government of the Philippine Islands, has recently devoted a week to studies in the herbarium and library of the New York Botanical Garden.

Mr. Allen H. Curtiss, well known as a collector and student of the plants of the southern United States and of the West Indies, died in Jacksonville, Florida, on September 1, in the sixty-third year of his age.

Dr. and Mrs. N. L. Britton are spending the month of September on the island of Jamaica. It is expected that the southwestern part of the island, where comparatively little botanical collecting has been done, will receive a large share of their attention at this time.

A "readership" in forestry has been established in Cambridge University and the appointment to the new position has been awarded to Dr. Augustine Henry, who is especially well known to botanists by his collections in China and Formosa. Dr. Henry visited the United States and Canada last autumn for the purpose, chiefly, of studying forestry conditions.

Dr. Carl Skottsberg, who was a member of the Swedish Antarctic Expedition of 1901–'03 and has since been engaged in studying his collections of the marine vegetation of that region,

will lead a new scientific expedition to the Falkland Islands and Tierra del Fuego. It is planned to leave Göteborg during the present month and to return to Sweden in April or May, 1909.

Dr. H. H. Rusby, dean of the College of Pharmacy of Columbia University and president of the Torrey Botanical Club, was elected second vice-president of the American Pharmaceutical Association at the meeting held in New York City during the first week in September. Dr. Rusby has recently received an appointment as an official expert in drug products to the Bureau of Chemistry, U. S. Department of Agriculture.

The interesting and important paper entitled "Contributions to the History of American Geology" published last year by Dr. George P. Merrill, head curator of geology, U. S. National Museum, in the Annual Report of the Smithsonian Institution for 1904, includes in an appendix, among biographical sketches of the principal workers in American geology, brief accounts of the lives of many who contributed also to the early progress of botany in America. Among such pioneers, sketches are given of Lewis C. Beck, W. H. Brewer, Samuel B. Buckley, Chester Dewey, Amos Eaton, Ebenzer Emmons, George Engelmann, F. V. Hayden, Edward Hitchcock, Joseph LeConte, Leo Lesquereux, Elisha Mitchell, Samuel Latham Mitchill, J. S. Newberry, Robert Peter, J. E. Teschemacher, and F. A. Wislizenus.

An appreciative article on "The Botanical Garden, New York," containing a considerable amount of rather naive misinformation, is published in *The Gardener's Chronicle* of London for August 24, 1907, *Die Gartenwelt* of July 20 being made responsible for the particulars. The article begins as follows:

"An idea of the enormous growth of New York, the second largest city in the world, with its 4,000,000 of inhabitants is obtained from the Bronx suburb, which is readily reached by two elevated railways and lies to the north of the city. This terrain, 20 years ago, was as difficult to reach as Philadelphia, and possessed a population of about 30,000 persons, distributed over an area of 917 square miles.* There were but few good houses,

* [The area of the Borough of the Bronx is given in the World Almanac as 40.65 square miles and its population in 1880 as 51,980, in 1890 as 88,908. — Ed.]

and these chiefly summer villas scattered about in a wilderness of luxuriant-growing deciduous trees. The rest were huts inhabited chiefly by criminals. To-day, the Bronx is one of the finest parts of New York, and the inhabitants number 400,000. Its most noteworthy feature is Bronx Park, which nature and art have united in forming into a charming idyll for the lover of nature."

Among the botanical visitors in New York City during the past summer, in addition to those already noted in TORREYA, may be mentioned the following: W. H. Lipsky, St. Petersburg; Professor F. L. Stevens, North Carolina Agricultural and Mechanical College, West Raleigh, N. C.; Professor M. A. Barber, University of Kansas, Lawrence, Kansas; Professor F. E. Lloyd, Mazapil, Zacatecas, Mexico; Professor William L. Bray, Syracuse University, Syracuse, N. Y.; Professor Douglas H. Campbell, Stanford University, California; Mr. William R. Maxon, U. S. National Museum, Washington, D. C.; Professor T. D. A. Cockerell, University of Colorado, Boulder, Colorado; Dr. H. N. Whitford, Forestry Bureau, Manila, P. I.; Dr. Clifton D. Howe, Biltmore Forest School, Biltmore, North Carolina; Dr. D. T. MacDougal, Carnegie Institution, Washington, D. C.; Professor D. S. Johnson, Johns Hopkins University, Baltimore, Md.; Professor John L. Sheldon, West Virginia University, Morgantown, W. Va.; Dr. J. N. Rose, U. S. National Museum, Washington, D. C.; and Mr. H. H. York, University of Texas, Austin, Texas.

TORREYA

October, 1907

Vol. 7. No. 10.

THE NAMES OF SOME OF OUR NATIVE FERNS

By Lucien Marcus Underwood

The publication of a complete index of fern names * has necessarily resulted in disclosing some overlooked duplications, some of which affect the names currently used in American text-books. For a European, Mr. Christensen has given a remarkably liberal treatment, and follows not only the American system of citation, but in the main the principles adopted in America underlying the selection of names. For example, homonyms are quite uniformly rejected and treated after the American fashion.

The unanimity of practice anticipated by some of our conservative friends as one of the benefits of "an *authoritative* international Congress" has failed to materialize among the ferns at least. Some recent publications professedly or supposedly in accord with the rules of the Vienna Congress must have afforded rude shocks to those whose expectations rose high in anticipation of "an authoritative standard."

For example, while Mr. Christensen, Dr. Christ, Professor Urban and Professor Hieronymus of Berlin, and Dr. Rosenstock have all taken up *Dryopteris* in accordance with correct principles of nomenclatural priority, the New England botanists have pronounced in favor of *Aspidium*, and the English botanists have taken up *Lastrea* for the same group. Without question, should the French make an official pronouncement, they would use *Polystichum*, thus continuing their practice in more or less recent manuals and botanical garden labels.

At present the common male-fern bears five names which have been announced since the appearance of the Rules of Nomen-

* Christensen, Carl. Index Filicum. 1905–6.

[No. 9, Vol. 7, of Torreya, comprising pages 177–192 was issued September 21, 1907.]

clature of the Vienna Congress — a state of discord not entirely unexpected by those who took part in the proceedings of that body.

The current nomenclature of the male-fern is as follows :

1. DRYOPTERIS FILIX-MAS.—American usage since 1893 ; adopted by Professors Urban and Hieronymus (Berlin) ; Dr. Christ (Basel) ; Dr. Rosenstock (Gotha) ; Mr. Christensen (Copenhagen).
(DRYOPTERIS Adans., 1763.)

2. POLYSTICHUM FILIX-MAS. — French usage.*
(POLYSTICHUM Roth, 1799.)

3. ASPIDIUM FILIX-MAS. — Cambridge (Mass.) usage.†
(ASPIDIUM Swartz, 1801.)

4. NEPHRODIUM FILIX-MAS. — Fern Bulletin ; Kew (ancient practice).‡
(NEPHRODIUM Rich., 1803. §)

5. LASTREA FILIX-MAS. — British Museum. ||
(LASTREA Bory, 1826.)

Following Diels (Die nat. Pflanzenf.) and Urban (Symb. Antill.), Christensen combines all the reniform-indusiate, non-indusiate, free-veined and connate-veined members of the tribe Dryopterideae in a single genus, *Dryopteris*. This would unite (in our flora) the genera *Phegopteris*, *Goniopteris*, and *Meniscium* with the wood-ferns of the genus *Dryopteris*. Pending further study

* As commonly seen in labels in botanical gardens ; also in recently published works as : **Coste**. Flore descriptive et illustrée de la France 3 : 686–688. 1906. In this work *Polystichum* and *Aspidium* are used for groups diametrically opposite to New England usage.

† *Cf.* Rhodora 9 : 81–86. 1907, where the allies of this species in the flora of "the Boston District" are placed under *Aspidium*, and the Christmas-fern is retained in *Polystichum*.

‡ No recent official pronouncement of the Kew position on this genus has been received ; we await with interest to see if there will be a change and if so whether it will be aspidioid.

§ The earlier and doubtful publication by Richard (?) in Marthe's Cat. pl. Jard. med. Paris, 1801, in accord with strict rules will have to be set aside as a hyponym.

|| As expressed in the new Catalogue of British Plants (1907), "revised in accordance with the International Rules of Botanical Nomenclature adopted by the Botanical Congress at Vienna, 1905."

of this complicated generic tangle of affinities, we are unable to follow the Continental botanists in this matter. Absolute consistency is not to be looked for in generic separation, but when *Diplazium* and *Athyrium* are kept distinct from *Asplenium* by such meager and graduated characters, *Elaphoglossum* from *Acrostichum*, and *Polystichum* from *Dryopteris*, we see no consistency in uniting *Meniscium* with *Dryopteris*, or *Campyloneurum* with *Polypodium*. There is perhaps more reason for the union of *Phegopteris* * and *Dryopteris*, since the difference is one which concerns mainly indusial characters. In any case, a knowledge of the European and United States species merely is insufficient to form a reasonable basis for a proper settlement of the question, and words based on such a knowledge are mere waste of breath.

Among the necessary changes we note the following:

Ceratopteris pteridoides (Hook.)

Parkeria pteridoides Hook. Exot. Fl. **2**: *pl. 147*. 1825.

After much study of living and herbarium material we are convinced that the determinable American material we have seen extending in range from Guiana, the type locality of Hooker's species, to Florida represents a plant entirely distinct from the species of the Old World which was included by Linnaeus under his two species, *Acrostichum siliquosum* and *Acrostichum thalictroides*, and commonly known under the name *Ceratopteris thalictroides* since Brongniart established that genus. Hooker's type and excellent figures well represent the plant occasional in our American tropics and often seen in cultivation.

The American plant has leaves much less divided than its Old World congener and is everywhere excessively proliferous, growing young plantlets over its surface at the sinuses of the leaves, and even in the axils of the sporophyls. Christensen follows the customary reference of the American plant to *Ceratopteris thalictroides* (L.) Brongn., but if, as appears, there is only a single species in the Old World, that name is not a valid one. There is a slight suspicion that the Old World species may also appear in

* In the new catalogue of British plants (1907) the species of *Phegopteris* are still retained in the genus *Polypodium* in accordance with the ancient Linnaean conception of that genus.

America as an introduced plant. Curtiss' collections in Florida (Nos. 3690 and 5973) well represent the American plant, as do the similar ones of Jenman from Guiana. *Parkeria* is one of five generic names which have been independently proposed for this group of plants and was based on Parker's original collection in Guiana, a duplicate sheet of which appears in the herbarium of Columbia University.

POLYPODIUM GLYCYRRHIZA D. C. Eaton. Am. Jour. Sci. II. **22**: 138. 1856

This properly takes the place of *P. falcatum* Kellogg, 1854, (not *P. falcatum* Linn. f. 1781) and of *P. occidentale* Maxon, 1904, the latter taken up from a still earlier varietal name of Hooker.

The abandonment of the validity of varietal names * was the principal compromise on the part of the adherents of the American code at the Vienna Congress. The above nomenclature is therefore in accord with both the Vienna and the American codes, and is based on the correct principle that *species* are the units of classification.

PALTONIUM LANCEOLATUM (L.) Presl, Epim. Bot. 156. 1851, appears to be the proper name for *Pteris lanceolata* L. (*Taenitis lanceolata* Kaulf.), for which we proposed Blume's subgeneric name *Cheilogramme* in 1900.

PTERIS MULTIFIDA Poir. Encyc. Bot. **5**: 714. 1804

The above name should be used for the plant commonly called *Pteris serrulata* Linn. f. (1781). The earlier *Pteris serrulata* Forsk. (1775) renders Linnaeus' name untenable. In this case there is an even stronger reason: in reducing *P. serrulata* Linn. f. to synonymy under *P. multifida*, Mr. Christensen continues an error most of us have followed without actually looking up the type locality of Linnaeus' plant. As a matter of fact *Pteris serrulata* is not only not a synonym of *Pteris multifida* at all; it

* This principle was adopted in America by a small majority in 1893-4 and in practice has worked havoc with many otherwise valid specific names. Probably two thirds of the opposition to the Madison modification of the Rochester rules arose from the adoption of this one principle.

is not even a *Pteris*, but a straight synonym of *Trismeria trifoliata* of the American tropics. Linnaeus' son described *Pteris serrulata* as from Jamaica and cites Sloane *pl. 45. f. 2* and Plumier *pl. 144*, the identical illustrations cited by his father in describing *Acrostichum trifoliatum* (*Gymnogramme trifoliata* Desv., *Trismeria trifoliata* Diels) twenty-eight years earlier.

Pteris multifida was published with a short Latin diagnosis followed by an ample comparative description in French, which ends with the following statement: "Cette plante est cultivée au Jardin du Muséum d'histoire naturelle de Paris. Son lieu natal ne m'est pas connu." The type locality of this species, therefore, remains unknown, and its long period of existence in cultivation, coupled with its ready propagation by spores, renders its original habitat somewhat difficult to prove. Its native country is usually supposed to be China and Japan. It is an escape from cultivation in several of our southern States, in Jamaica and Guadeloupe, and is likely to be found in any of the warm-temperate or tropical countries, where it is frequently cultivated.

Pellaea mucronata D. C. Eaton

This name must replace *Pellaea Wrightiana* Hook. The continued use of the latter name is due to a curious oversight of the application of the so-called "Kew rule." The plant was originally described as *Allosorus mucronatus* D. C. Eaton (1856). When Hooker took up Link's genus *Pellaea* in Species Filicum (1858) he followed a common practice of his day and renamed the species *Pellaea Wrightiana*, thus making his own name the "first name under the genus." Eaton did not transfer his own name *mucronata* until a year later (1859) and his earlier publication was not unnaturally overlooked. The abolition of the Kew Rule by the Vienna Congress will render this change equally binding on those who recognize its authority. Under the American code it is a simple matter of justice and it becomes a pleasure to restore one of Professor Eaton's names.

Pellaea scabra C. Chr. Ind. Fil. 483. 1906

Cheilanthus aspera Hook. 1858 (not *C. aspera* Kaulf. 1831).
Pellaea aspera Baker, Syn. Fil. 148. 1867.

The change appears to be warranted.

ASPLENIUM ABSCISSUM Willd. Sp. Pl. **5**: 321. 1810

Asplenium firmum Kunze (1845) appears to be identical with this widely distributed tropical species and hence falls under it in synonymy.

ASPLENIUM CRISTATUM Lam. Encyc. Bot. **2**: 310. 1786

Asplenium cicutarium Sw. (1788), proving an exact synonym, must yield to the earlier name. The occurrence of this common tropical American fern in Florida rests on a single meager collection. Further information of its occurrence within the limits of the United States is greatly to be desired.

Mr. Christensen has made a few other changes, particularly in *Notholaena* and *Pellaea*, which we are not prepared to adopt, pending a revision of the species of these groups. Among these is the transfer of *Notholaena dealbata* and *N. tenera* to *Pellaea*. *Pellaea densa*, which Diels transferred to *Cryptogramma* in 1899, Christensen restores to *Pellaea*.

COLUMBIA UNIVERSITY,
September 30, 1907.

A LONG ISLAND CEDAR-SWAMP

BY ROLAND M. HARPER

No cedar swamp on Long Island (or any other island, for that matter) seems to have ever been described in botanical literature, though evidences of the occurrence of such places on the island are not wanting. Such swamps, at least in the coastal plain and southeastern part of the glaciated region of North America, are characterized by the white cedar, or "juniper," *Chamaecyparis* (formerly *Cupressus*) *thyoides*; and Dr. Torrey says of this species in his Flora of New York, published in 1843: "Long Island, where, in several places (as near Rockaway, Hempstead, Babylon and Islip) it occurs in considerable quantities." The localities mentioned are all in the coastal plain,* but I do not know that any of them have been verified in late years.

* Some maps of Long Island (such as can be seen in almost any railroad station on the island) show a settlement named "Cedar Swamp" about three and one half

In TORREYA for June, 1906, it stated that on May 30 the Torrey Club visited "a white cedar swamp near Merrick" (near the south shore of the island), and found there among other things *Dryopteris simulata*, *Woodwardia areolata* and *W. Virginica*. In *Rhodora* for April, 1907, Mr. J. T. Nichols reported "a good colony of the tree growing . . . between the stations of Merrick and Bellmore, Nassau Co." (doubtless the place visited by the Torrey Club), and regarded this as the westernmost known station for it on the island, which it probably is, unless Torrey's Rockaway station still exists.

Following the clue given by Mr. Nichols, I went on July 3d, last, to the place indicated, which is just 25 miles from Long Island City by rail. The *Chamaecyparis* occurs for some distance (several hundred yards at least) north and south of the railroad, along Baldwin Creek, a small stream two or three miles in length. It is most abundant below the railroad, and almost within a stone's throw of the salt marsh into which the creek flows. Here there are some thousands of the trees in question, ranging from about 3 to 10 inches in diameter and 30 to 40 feet in height, growing in the driest situation in which I ever found this species, a condition which, however, is probably not natural. For just above the railroad the creek is dammed up to make one of the reservoirs of the Brooklyn water system, and as shown by Veatch,* whenever a stream in the sandy coastal plain of Long Island is thus obstructed a large amount of water escapes through the porous sides of the pond. The fact that no trees less than three inches in diameter were seen would seem to indicate that no young ones have come up for several years, perhaps ever since the reservoir was made.

The only other trees noticed in this swamp were a few specimens of *Sassafras*, one at least a foot in diameter and as tall as

miles northeast of Roslyn, in the glaciated region; but on a recent visit to the spot indicated I could find no perceptible aggregation of houses, no *Chamaecyparis*, nor even any swamp. Inquiry at a house near by elicited the information that the road I was on was called the Cedar Swamp Road, but my informants did not know why, and after walking along it for several miles I knew no more about it than before.

* Professional Paper U. S. Geol. Surv. 44: 62. 1906. "The effect of dams in the brooks of Long Island is . . . to very materially decrease the stream flow at the points where dams are erected."

the cedars, and several of *Acer rubrum*. The shrubby and herbaceous vegetation consisted chiefly of the following species :

Viburnum dentatum	*Unifolium canadense*
Kalmia latifolia	*Arisaema triphyllum*
Clethra alnifolia	*Spathyema foetida*
Aralia nudicaulis	*Carex folliculata*
Parthenocissus quinquefolia	*Lycopodium lucidulum*
Ilicioides mucronata	*Woodwardia* (*Lorinseria*) *areolata*
Ilex verticillata (?)	*Dryopteris simulata* (?)
Benzoin aestivale	*Osmunda spectabilis* (*regalis*)
Rhus Vernix	*Osmunda cinnamomea*
Rhus radicans	*Sphagnum sp.*
Rubus hispidus	

A little farther up the creek, near the railroad, were noticed most of the same species, and in addition *Trientalis americana*, *Gaylussacia frondosa*, and *Azalea viscosa glauca*.

The *Aralia* seemed to be the most abundant dicotyledon in the swamp. *Lycopodium lucidulum* does not seem to have been previously reported from Long Island, though Dr.G.H. Shull tells me that it is not uncommon in the vicinity of Cold Spring Harbor, on the north shore. I was greatly surprised to find it in the coastal plain (doubtless a new region for it), and so close to a salt marsh.

Chamaecyparis thyoides is one of the very few conifers (and the only water-loving one) indigenous to both the glaciated region and coastal plain, and the only one now confined to these two regions.* (Not much is known of its prehistoric distribution, for in the fossil state it is reported only from the Pleistocene of New Jersey, and the buried trunks found in the coastal plain farther south are mostly in places where it still grows.) Its relations to the topography in the two different regions are rather interesting. In the glaciated region I have seen it only in "kettle-holes," or "undrained swamps," while in the coastal plain it seems to be confined to "drained" but non-alluvial swamps. Its very irregular distribution in the coastal plain has been recently commented upon.†

College Point, L. I.

* See Rhodora 7 : 71. 1905.

† Bull. Torrey Club 34 : 377. 1907.

DETERMINATIONS OF CUBAN PIPERACEAE

By C. F. Baker

During the past two years a large number of specimens of Piperaceae have been distributed from the herbarium of the Estación Central Agronómica de Cuba. These were collected in the Provinces of Habana and Pinar del Rio by employees of the Station and by Mr. H. A. Van Hermann. In some instances the names originally placed on the specimens were incorrect, and in many cases no specific name was given. Determinations of these specimens have largely been furnished by Dr. I. Urban and by Prof. C. de Candolle, and to these gentlemen acknowledgments are due. I have also compared all of them with material in the Sauvalle-Wright collection and with some material received in exchange. It will be of interest and importance to all who have received the specimens to have access also to these combined notes.

Peperomia rotundifolia Kth.

Rangel, Prov. Pinar del Rio (*4215*). This is exactly equivalent to Wright's *no. 521*, labelled *nummularifolia* by him, but in Symbol. Antill. **3**: 228, called *rotundifolia* Kth.

Peperomia sp. nov.

Mountains above Taco-Taco (*3833*).

Peperomia alata R. & P.

Santa Barbara, near Bejucal (*3382*). Dr. Urban has referred this to *P. glabella* A. Dietr. These specimens are, however, equivalent to our specimens of Wright's *no. 503*, which was questionably labelled *P. pterocaulis* Miq. by Wright, and in the Symbol. Antill. **3**: 241, referred to *P. alata* R. & P.

Piper aduncum L.

As determined by de Candolle, it appears that none of the many western Cuba specimens sent out under this name by us and by others belong here. We have specimens of true *aduncum* only from eastern Cuba (Eggers *no. 4654*). All of our Western Cuba specimens issued as this belong to *P. elongatum* var. *Ossanum*.

Piper articulatum A. Rich.

Vento (*1322*).

Piper elongatum Vahl

In a recent letter de Candolle says "With regard to *Piper elongatum* Vahl, I must tell you that I have quite recently come to the conclusion that this name is to be substituted to that of *Piper angustifolium* R. & P."

Piper elongatum Vahl, var. Ossanum C. DC.

Near Artemisa (*1750*); mountains near Taco-Taco (*3788*); Managua (*4570*); Rincón (*1016*); Vento (*585*); Santiago de las Vegas (*3657*, *2208*, *447*). All were issued as *aduncum*.

Shafer's *no. 459* from Madruga, and his specimen without number from Havana, as well as Curtiss' *no. 443* from Isle of Pines, all belong here.

All of Sauvalle's *no. 2241*, represented by five sheets and labelled *Artanthe adunca*, are this, as well as Wright's "El Retiro, Apr. 4" specimen (Sauvalle *no. 2243*), labelled *elongata*.

In Symbol. Antill. **3**: 186, de Candolle refers to Sauvalle's *no. 2241* under *confusum*. Sauvalle had placed Wright's *no. 773* with his *no. 2241*, though Wright's label bears also the name *Piper confusum* C. DC. Wright's field notes for *confusum*, which I have not seen quoted, read "*Artanthe adunca* Miq.? Principal veins 3–4 pairs and smaller. Along rivulets in woods. Monte Verde. May." This would indicate a habitat distinct from that of *aduncum*, or of *elongatum* var. *Ossanum*.

Piper hispidum Sw.

San Antonio de los Baños (*4773*); Vento (*572*). The latter was labelled *hirsutum*.

Piper hispidum C. DC. var. magnifolium C. DC.

San Antonio de los Baños (*4117*, *4578*) were issued simply as *hispidum*. Santiago de las Vegas (*3647*, *5055*).

Two N. Y. Botanical Garden specimens from Matanzas (*229*, *420*) also belong here.

Piper medium Jacq.

San Antonio de los Baños (*4122*, *4789*). This forms dense thickets along the wooded river banks above the town.

Piper rigidum C. DC.

Santa Catalina (*3262*). One of many fine things brought from this interesting locality in the western Sierra, by VanHermann.

Wright's *no. 1418*, *rigidum* var. *verdeanum*, is Sauvalle's *no. 2247*. Wright's *2269* and *2270* are Sauvalle's *no. 2238*. But on two other specimens of his own, doubtless of the collecting of Blain in western Cuba, Sauvalle has also placed the number *2238*, though these specimens are much more like Wright *1418* — Sauvalle *2247*. But neither of these two specimens are at all like our *no. 3262*.

HECKERIA UMBELLATA (L.) Kth.

Abundant along fence rows, borders of thickets, and outcropping ledges, all through western Cuba. Specimens issued are from Managua (*1562*); hills near Candelaria (*1614*, *1615*); near Artemisa (*1751*); Guanajay Mountain (*2187*); Rangel (*3833*); Vento (*582*); near Calabazar (*4905*); Santiago de las Vegas (*1089*, *3523*). I have not yet seen *peltata* growing in western Cuba. Dr. Maza has in the Jardin Botanico de la Universidad de Habana, a foreign *Heckeria* which, however, is not *peltata*.

SANTIAGO DE LAS VEGAS, CUBA.

SHORTER NOTES

A REDWOOD DESCRIBED AS A MOSS. — In the account of the fossil mosses of Florissant, published by Mrs. Britton and Dr. Hollick in the *Bulletin of the Torrey Botanical Club* for March, is a new figure of *Hypnum Haydenii* Lesq., accompanied by the remark that it appears to be a conifer. From a study of a large amount of material from Florissant, I had already concluded that the conifers found there belonged to four species,* namely *Sequoia affinis* Lesq., a *Sabina*, and two species of *Pinus*. The alleged moss has no particular resemblance to the *Sabina* or *Pinus*, but it *exactly agrees with the growing tips of the Sequoia*. I have before me a branch, with ordinary leaves, of *Sequoia affinis*, and on the same piece excellent "*Hypnum Haydenii*." There appears to be no doubt whatever about the identity of the two, and the moss name has priority of place. Hence the Florissant redwood

* The particulars will be published in Bull. Amer. Mus. Nat. Hist.

appears to be entitled to the name **Sequoia Haydenii** (*Hypnum Haydenii* Lesq. Ann. Rept. U. S. Geol. and Geog. Surv. Terr. 1874: 309. 1876; *Sequoia affinis* Lesq. *l. c.* 310).

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REVIEWS

Two recent Papers by O. F. Cook

"*Origin and Evolution of Angiosperms through Apospory.*"* It is suggested in this paper that the phylogeny of the angiosperms is not to be sought from the bryophytes, up through the cycadofilices, but "more directly in some such primitive condition as the thallose liverworts." The female reproductive apparatus of the angiosperms would thus be considered analogous (homologous?) to the fern prothallia that are borne directly upon the sporophyte without the intervention of spores.

Anthoceros is named as the most probable hepatic ancestor of the angiosperms, since it is held to be, in point of structure, "farther advanced than the ferns in the direction of the angiosperms. . . . The independent existence of the vegetative *Anthoceros* capsule would afford a plant like a seedling angiosperm with its two cotyledons, but bearing spores on the inner surfaces of the cotyledons. No steps are required which have not been closely paralleled in the evolution of one or another of the archegoniate plants. . . . The part of the angiosperm which, in the present view, might correspond to the prothallus itself, is the nucellus."

"The fern and the flowering plant are alike in that their ancestors can be traced back to the capsules of simple thallose plants like *Anthoceros*, but there appears to have been at some very remote point a divergence of procedure, the group which gave rise to the ferns and gymnosperms retaining for a much longer period a functional prothallus which the adoption of apospory enabled the ancestors of the angiosperms to completely eliminate."

* Cook, O. F. Proc. Wash. Acad. Sci. 9: 159. 1907.

In this connection it will be recalled that in 1891 Atkinson suggested that the embryo-sac is to be interpreted as a female prothallus, originating from the nucellus by apospory, but that there is not, therefore, to be inferred any phylogenetic connection with earlier forms, nor that the process of aposporous origin of the gametophyte is continuous through the groups of plants.

"*Mendelism and Other Methods of Descent.*"* This paper is an elaboration of a discussion of Davenport's lecture on "Heredity and Mendel's Law," delivered before the Washington Academy of Sciences, on February 26, 1907. It is contended that, "the definite mathematical relations which appear in a Mendelian experiment arise from the methods of reproduction rather than from the methods of inheritance," and that the inferences as to the existence of character-unit-particles and the purity of germ cells are rendered entirely unnecessary by the interpretations which the author gives to the experimental results of others.

Descent and heredity are by no means synonymous. There are outlined twenty-two different methods of descent, of which heredity is one, mutation another, and Mendelism another. "Heredity, in the more definite sense, is a fact, but only under conditions of restricted descent." Mendelism is not a form of heredity, but "constitutes a rather wide departure from the primary concept of heredity." It is "one of the methods of descent in which unlike produce unlike." According to Cook, there has been a complete failure, thus far, to demonstrate the Mendelian principles. The terms hybrid and cross seem (p. 223) to be considered as synonyms.

Although artificial selection has been satisfactorily practiced in horticulture for decades, the author declares that, "generally speaking, the cells which compose the bodies of the higher organisms do not leave any descendants to perpetuate their characters." Mutation and Mendelism "are not phenomena of evolution, but of degeneration," and, "when the distinction between discontinuous variation and discontinuous evolution is once appreciated, it will become apparent that the mutation theory

* Cook, O. F. Proc. Wash. Acad. Sci. 9 : 189. 1907.

and the Mendelian 'laws' which have been enlisted in its support are assumptions which the facts do not warrant."

Here certainly is a challenge that, to say the least, cannot be considered wavering or indirect. Without discussing these iconoclastic ideas, it may be remarked that the author's conclusions are diametrically opposed to the inferences of practically every investigator who has derived his knowledge of the facts at first hand.

C. Stuart Gager.

FIELD MEETINGS OF THE TORREY BOTANICAL CLUB, SEASON OF 1907

Below is a list of the field meetings of the Club during the present season, as announced by the field committee. In a few cases, the program was not carried out on account of unfavorable weather.

May 4. West Orange, N. J. Guide, Mr. P. Wilson.

May 11. Great Notch, N. J. Guide, Mr. Frederick K. Vreeland.

May 18. Hempstead, Long Island. Special excursion for violets. Guide, Miss Fanny A. Mulford.

May 25. Mount Kisco, N. Y. Guide, Dr. P. A. Rydberg.

May 30. Avon, N. J. Guide, Mr. P. Wilson.

June 1. Long Beach, Long Island. Guide, Dr. R. M. Harper.

June 8. Mountain Station, N. J. Guide, Mr. William H. Smith.

June 15. Scarsdale, N. Y. Special excursion for fungi. Guide, Dr. W. A. Murrill.

June 22. West Orange, N. J. Guide, Mr. R. C. Benedict.

June 29. New York Botanical Garden and vicinity. Special subject: "The Care and Protection of Trees." Guide, Dr. C. Stuart Gager.

July 1–7. Fourth Botanical Symposium. Joint meeting of the Torrey, the Philadelphia, and the Washington Botanical Clubs. Newton, Sussex County, N. J. Reported in Torreya for August by Dr. Philip Dowell.

July 13. Central Park, New York City. Guide, Dr. E. B. Southwick.

July 20. Moonachie, N. J. Guide, Mr. George V. Nash.

July 27. Little Falls, N. J. Guide, Dr. H. H. Rusby.

August 3. Summit, N. J. Guide, Dr. P. A. Rydberg.

August 10. Great Island, N. J. Guide, Dr. H. H. Rusby.

August 17. Saw Mill Valley, Borough of the Bronx, New York City. Special excursion for mosses. Guides, Mrs. N. L. Britton and Mr. R. S. Williams.

August 24. Sneeden's Landing, N. Y. Guide, Mr. Norman Taylor.

August 31. Richmond, Staten Island. Guide, Dr. Philip Dowell.

September 7. Prince's Bay, Staten Island. Guide, Dr. Arthur Hollick.

September 14. New Rochelle, N. Y. Guide, Miss Daisy Levy.

September 21. Arlington, Staten Island. Guide, Professor L. M. Underwood.

September 28. Mosholu, N. Y. Special excursion for asters. Guide, Professor E. S. Burgess.

October 5. Hunter's Island, New York City. Special excursion for marine algae. Guide, Dr. Marshall A. Howe.

October 12. New York Botanical Garden. Special subject: "Variations in Plant Organs; a Study in Morphology." Instructor and guide, Dr. C. Stuart Gager.

NEWS ITEMS

John H. Schaffner, associate professor of botany in the Ohio State University, will spend the present scholastic year in Germany and Dr. A. Dachnowski will act as substitute for him during his absence.

Dr. C. B. Robinson, assistant curator of the New York Botanical Garden since July 1, 1906, has been appointed economic botanist of the Bureau of Science of the Government of the Philippine Islands, and is planning to sail for Manila early in the coming year.

Dr. Harold L. Lyon has resigned the assistant professorship of botany in the University of Minnesota in order to accept a

position as assistant director of the pathological laboratory of the experiment station maintained by the Hawaiian Sugar Planters' Association at Honolulu.

Mr. Oakes Ames, founder of the Ames Botanical Laboratory at North Easton, Massachusetts, has presented his valuable collection of living orchids to the New York Botanical Garden. The collection includes plants of great rarity and will form a notable feature in the conservatories of the Garden.

Professor William Bateson, of Cambridge University, England, is announced by the Brooklyn Institute of Arts and Sciences to give three illustrated lectures entitled "Demonstrations of Mendel's Principles of Heredity," at the Art Building Hall, 174 Montague Street, on the evenings of October 3, October 31, and November 1.

Professor C. F. Baker, for three years past chief of the department of botany in the Estación Central Agronómica, at Santiago de las Vegas, Cuba, has been appointed curator of the herbarium and botanic garden at the Museu Goeldi, Para, Brazil. All letters and packages should be addressed to him at that point after November 1, 1907. His especial work there will be the further development of the herbarium and garden at Para, and the botanical exploration of some of the most interesting parts of the Amazon valley.

The New York Botanical Garden announces for the autumn of 1907 the following program of Saturday afternoon lectures:

Oct. 5. "**The Salton Sea and its Effect on Vegetation,**" **by Dr. D. T. MacDougal.**

Oct. 12. "**Collecting Fungi in the Wilds of Maine,**" **by Dr. W. A. Murrill.**

Oct. 19. "**The Forms and Functions of Leaves,**" **by Dr. C. Stuart Gager.**

Oct. 26. "**The True Grasses and their Uses,**" **by Mr. George V. Nash.**

Nov. 2. "**The Giant Trees of California: their Past History and Present Condition,**" **by Dr. Arthur Hollick.**

Nov. 9. "**The Progress of the Development of the New York Botanical Garden,**" **by Dr. N. L. Britton.**

Nov. 16. "**Edible Roots of the United States,**" **by Dr. H. H. Rusby.**

The lectures will be delivered in the museum building at 4 o'clock and will be illustrated by lantern slides and otherwise.

TORREYA

November, 1907

Vol. 7. No. 11.

A VISIT TO LETCHWORTH PARK

By George V. Nash

Lying in the western part of New York state, in the counties of Wyoming and Livingston, is a wild and picturesque country, through which the Genesee River wends its way. Here, in a strife which was begun in ages past and which is still continued between the waters and the land, this river has cut for itself, in a portion of its course, a deep gorge between two and three miles long. In this distance the river has a fall of about three hundred feet, the greater part of this being concentrated in three falls, known as the upper, middle, and lower falls. Crossing this gorge, immediately above the upper fall, is a bridge, from which one can look down on the swirling waters of the river 232 feet below, just above where they take their plunge of about ninety feet over the upper fall, which stretches itself diagonally across the river in a somewhat curved line, its lower edge resting on the westerly bank. About 2,200 feet below the upper fall is the middle fall, which is said to plunge 110 feet to the waters below. This is by far the largest of the three falls and the most impressive. It has worn itself a deep pit, in which the maddened waters eddy and swirl, finally emerging, humbled and subdued, as a narrow stream, which flows quietly for about a mile and a third, when it again becomes troubled, and makes its final plunge over the lower fall, which has a height of about sixty feet. Here we find Table Rock, a plateau some 800 feet long and about 150 feet wide, almost truncate at its lower end, over which, in times gone by, the river leaped to the waters sixty or seventy feet below. To the right of this Table Rock, as you look down stream, the Genesee rushes madly through a narrow and deep channel it has cut for itself in comparatively recent times. The southerly side of

[No. 10, Vol. 7, of TORREYA, comprising pages 193–208, was issued October 18, 1907.]

this rocky plateau, at one time the bed of the river, must have been of material much softer in nature than the remainder of the rock, else the river would not have made its present channel there. Standing on the edge of this channel and looking into the churning waters below, one cannot help but realize what his fate would be were he to make a misstep and fall. At the western end and in the rear of Table Rock, across an intervening chasm, is the lower fall, resembling more the upper fall in the diagonal line of its brink which has its upper end resting on the north shore. The fall has worn for itself an ample basin, bounded by Table Rock and its own brink, the shape of which, the oldest inhabitants declare, has changed considerably in the past fifty years. Below Table Rock the waters wend their monotonous way, quite changed in character from their aggressiveness of the upper stretches.

It is between the lower and middle falls that the gorge of the Genesee is best developed. Here we find sheer perpendicular precipices rising 300 to 500 feet above the surface of the river, which, viewed from above, looks like a tiny silver thread.

As I have said, it is the middle fall which is the most impressive. And here, within hearing of the constant roar of this falling mass of waters, the spray from which is often carried by the wind onto the house itself, the Honorable James Pryor Letchworth has made his home for over fifty years. It is to the generosity of this gentleman, whose horizon is not bounded by the narrow confines of commercialism, that the public is indebted for this beautiful tract, now accepted by the state as a gift from Mr. Letchworth, and bearing the name of Letchworth Park, a fitting honor commemorating a noble deed. The tract was acquired gradually by Mr. Letchworth by the expenditure of a considerable sum. By the deed of gift he is to enjoy the use of the property as long as he lives, it then passing to the state, under the guardianship of The American Scenic and Historic Preservation Society, of which Mr. J. Pierpont Morgan is honorary president and Mr. Geo. F. Kunz president.

The tract embraces over 1,000 acres, and includes both sides of the river for a distance of nearly three miles, comprising in this extent all three of the falls, thus, it is to be hoped, protecting them from the devastating hand of those who see nothing in the

imposing works of nature but dollars and cents and to whom her beauties and the rights of others make no appeal.

Mr. Letchworth lives in a home-like roomy house situated only about 250 feet from the edge of the precipice which makes a sheer descent into the deep pool in front of the fall. Here on bright sunny days rainbows play in the mists constantly arising from the tumbling waters, distant but about 350 feet from the house, and from this Mr. Letchworth has named his home Glen Iris.

The object of my visit to this park was to name and have properly labeled the trees in the vicinity of the roads and paths, which Mr. Letchworth has constructed and is constructing through this tract, that the public may have easy access to all of its beauties. One is at once struck here by the purity of the vegetation. By this I mean the almost entire absence of plants not native to the tract. Even in the immediate neighborhood of the house, where the open lawns would permit of such treatment, but few extraneous species are to be found. Such plants are, however, represented by the horse-chestnut (*Aesculus Hippocastanum*), of Greece, the sweet or yellow buckeye (*Aesculus octandra*), of the southeastern United States, and the fetid or Ohio buckeye (*Aesculus glabra*), of the central United States. Others of this nature are the sweet gum (*Liquidambar Styraciflua*), the Norway maple (*Acer platanoides*), of Europe, the maiden-hair tree (*Ginkgo biloba*), of China, the purple form of the European beech (*Fagus sylvatica purpurea*), the Norway spruce (*Picea excelsa*), of Europe, in some noble specimens, and the Colorado spruce (*Picea Parryana*). It is plain on all sides that every attempt has been made to keep things as nature made them. The arboreal vegetation is well represented, and in one region down near the lower fall, inaccessible to the lumberman on account of the precipitous bluff on one side and the raging waters of the river on the other, are some large trees, perhaps representing the original growth. I had a most enjoyable time for two days going over this tract. Of course in that limited period it was not possible to make an exhaustive study of the trees, my operations being confined to the vicinity of the paths, but here a large proportion of the species must be represented.

Among the conifers the most common tree is the white pine (*Pinus Strobus*). This grows in great quantities, springing up

readily on all unoccupied lands. Occasionally, where the destroying ax of the lumberman did not do its deadly work before Mr. Letchworth acquired possession of the land, large specimens of this tree are to be found. The next conifer in point of frequency is also a pine (*Pinus resinosa*), the Canadian, Norway, or red pine. This also has attained a great size in places, especially along the path which skirts the north shore of the river on the way to the lower fall. The red cedar (*Juniperus virginiana*) occurs sparingly. The hemlock (*Tsuga canadensis*) is also quite common, vying in frequency with the Canadian pine. The tulip-tree (*Liriodendron Tulipifera*) is quite conspicuous in places with its shaft-like columnar trunks, and the American beech (*Fagus grandifolia*) added a touch of gray to the forest. The American elm (*Ulmus americana*), the chestnut (*Castanea dentata*), and the American linden or basswood (*Tilia americana*), are of frequent occurrence. The dreaded chestnut disease, which is causing such havoc to these trees in the vicinity of New York City, does not appear as yet to have reached this neighborhood. A single tree of the white basswood (*Tilia heterophylla*) was observed on the brink of the precipice, not far from the house. The paper or canoe birch (*Betula papyrifera*) and the yellow birch (*Betula lutea*) are occasionally met with. The American hornbeam (*Carpinus caroliniana*) is not as common as the hop-hornbeam (*Ostrya virginiana*). The common wild black cherry (*Padus serotina*), with its rough checkered bark, is not uncommon. Among the hickories the small-fruited hickory (*Hicoria microcarpa*) is much more frequent than the shag-bark (*Hicoria ovata*). The ashes yield but one species, so far as observed, that was common, and this was the white ash (*Fraxinus americana*). A second species with a tall straight trunk was observed, but the foliage was borne so high in the air that it was not possible to make a satisfactory determination of it. From leaflets picked up on the ground I am strongly inclined to think it is the green ash (*Fraxinus lanceolata*). Its bark was very coarse and deeply furrowed. The maples yielded the sugar maple (*Acer Saccharum*) in abundance, and the red maple (*Acer rubrum*) more sparingly. Of the black sugar maple (*Acer nigrum*) only a few specimens

were seen. The oaks are perhaps the most numerous as to species, of which five were noted. These are: the white oak (*Quercus alba*), the most abundant; the red oak (*Quercus rubra*), perhaps next in frequency; the black oak (*Quercus velutina*); the chestnut or yellow oak (*Quercus acuminata*), and the gray oak (*Quercus borealis*). Other trees seen in the tract are the walnut (*Juglans nigra*), rare; the butternut (*Juglans cinerea*), common; the buttonwood or sycamore (*Platanus occidentalis*), rare; the large-toothed aspen (*Populus grandidentata*), the cottonwood (*Populus deltoides*), and the balm of Gilead (*Populus candicans*); the cucumber-tree (*Magnolia acuminata*) was quite frequent, especially in the woods bordering the path on the north side of the river on the way to the lower fall; and the flowering dogwood (*Cynoxylon floridum*).

The shrubby vegetation was not particularly noted, as the time was fully occupied in inspecting the trees. One could not help but notice a number of species of the thorn (*Crataegus*), some of them really small trees. The witch hazel (*Hamamelis virginiana*) was attractive in its yellow flowers, just unfolding. The spice-bush (*Benzoin Benzoin*), the speckled or hoary alder (*Alnus incana*), and the dockmackie (*Viburnum acerifolium*) were among those seen. There were many herbaceous plants, but the time at my disposal would not permit of even a cursory examination of them. It would be an interesting work to prepare a list of all the plants growing wild within the confines of this park, and such a list might perhaps have its value to the public.

Another interesting feature of Letchworth Park is what is known as the Council House grounds, a small area so named on account of the presence there of an old Indian council house, moved from its former site by Mr. Letchworth for preservation here. This house was taken down under Mr. Letchworth's directions, each part being carefully numbered, and erected again in its original form. Near by stands a modern structure containing a valuable collection of Indian relics. And not far off is the grave of Mary Jamison, a white woman who had rather a checkered career in her enforced life among the Indians.

Mr. Letchworth informed me that many people visit the

grounds, which are open every week day and during the afternoon on Sundays, the latter a recent innovation to accommodate visitors who are not able to visit the park at other times. People come from Rochester, Buffalo, and other neighboring towns, often in the form of classes or excursions of considerable size. The region is accessible from Portage, a station on the Erie Railroad, distant from New York City about 363 miles. This station is but a short distance from the bridge, referred to in the early part of this article, across which one must go to reach the system of paths installed by Mr. Letchworth. From this bridge one gets his first introduction to the gorge of the Genesee, for a magnificent view is obtained, from this high vantage point, of the falls and gorge.

The whole tract is beautiful and impressive with its rugged wild scenery, the grandeur of its water falls, and the feeling of the wild that pervades it all. The public and the state are certainly to be congratulated upon the acquisition of so beautiful a park, and it is devoutly hoped that no mercenary interests, for none others would have the inclination nor the audacity, will succeed in accomplishing anything that will mar the beauty and the grandeur of this, one of nature's finest works.

New York Botanical Garden.

SOME RARE AND INTERESTING PLANTS OF BERKS COUNTY, PENNSYLVANIA

By W. H. Leibelsperger

Notwithstanding the fact that some of the plants here listed may never have been credited to this locality, they have all been found by the writer in his many botanical and ornithological tramps. The plants listed have been found either on the Irish Mountains south of Fleetwood, on the Blue Mountains, which lie about fifteen miles north of the Irish Mountains, or in the vast stretch of hills and lowlands between these mountains.

The "Illustrated Flora" of Britton and Brown has been followed in nomenclature and arrangement.

Ophioglossum vulgatum L. Rare. Specimens of this odd little

fern were found in a sandy meadow near Moselem Springs, and in moist rich woods in the Blue Mountains, where nice specimens were found on October 13, 1907. Specimens 13 inches high were seen.

Botrychium simplex E. Hitchcock. Rare. This interesting little grape-fern was found on June 30, 1907, at the edge of moist woodland about one mile southeast of Fleetwood. Numerous specimens, ranging in height from 3 to 9 inches, were found.

Botrychium lanceolatum (S. G. Gmel.) Ångs. Rare. Specimens of this fern were found in the locality named for *B. simplex*, but later.

Botrychium dissectum Spreng. Frequent specimens were found in meadows and moist woods on the Irish Mountains, as well as on the Blue Mountains.

Camptosorus rhizophyllus (L.) Link. Frequent. The walking-fern grows in a number of places in the county, but the largest specimens, with leaves from 9 to 15 inches long, were found near Lenhartsville.

Cypripedium hirsutum Mill. Not common. Specimens of this ornamental plant were found on the Irish and the Blue Mountains. Many plants with two flowers have been seen.

Orchis spectabilis L. Infrequent. Specimens of this pretty and interesting plant were found near Pikeville and in the Blue Mountains.

Habenaria orbiculata (Pursh) Torr. Rare. Specimens were found about two miles southeast of Fleetwood.

Habenaria ciliaris (L.) R. Br. Infrequent. This, the most handsome species of the genus, grows in moist rich woods on the Irish Mountains, as well as on the Blue Mountains.

Habenaria psycodes (L.) A. Gray. Not common. Specimens were found near Pricetown.

Pogonia ophioglossoides (L.) Ker. Frequent. Found in several localities, but is not so frequently met with as *P. verticillata*.

Aplectrum spicatum (Walt.) B.S.P. Rare. This interesting plant is found in a number of places in the county, but is everywhere regarded as rare.

Hydrastis canadensis L. Rare. Golden seal was found near Evansville, the only locality known to the writer.

Coptis trifolia (L.) Salisb. This interesting little evergreen plant grows abundantly in moist rich woods southeast of Fleetwood as well as in the Blue Mountains.

Caulophyllum thalictroides (L.) Michx. Infrequent. This plant has been found in a number of places, but it grows most abundantly several miles north of Virginsville.

Crataegus moselemensis Gruber. The typical *Crataegus moselemensis* stands about one-half mile west of Moselem. This giant hawthorn is probably without an equal, being 7 m. high and having a spread of 13.7 m. It has a trunk circumference of 2 m. near ground and is about 95 years old.

Drosera rotundifolia L. This insectivorous plant was found in several bogs on the Irish Mountains.

Cubelium concolor (Forst.) Raf. Not common. Found numerous specimens, ranging in height from 0.6 m. to 1 m., near New Jerusalem, the only locality known by the writer.

Panax quinquefolium L. This plant is becoming very scarce in this locality owing to the high price realized for its root. Specimens were found near Harlem.

Oxycoccus macrocarpus (Ait.) Pers. Grows abundantly in bogs near Pricetown, the only known locality in the county.

Gentiana crinita Froel. Infrequent. Found in a meadow in "Pine Swamp," Blue Mountains.

Truly did some poet write:

> "Thou waitest late and comest alone,
> When woods are bare and birds are flown,"

for the writer has found nice specimens in blossom as late as November 15.

Obolaria virginica L. Infrequent. This ornamental little plant presents a decided exception to the other members of the family in that it makes its appearance early in the spring. Specimens have been found in different localities in the county, but the prettiest branching specimens are found in rich woods near Moselem.

Menyanthes trifoliata L. Rare. This interesting member of the gentian family grows abundantly in a bog near New Jerusalem, the only locality known to the writer. Specimens with 4-foliolate leaves have been collected.

Limnanthemum nymphaeoides (L.) Hoffm. & Link. Rare. This pretty and interesting plant grows in a small pond near Moselem. How it happened to be introduced there the writer has in vain tried to ascertain.

Castilleja coccinea (L.) Spreng. This showy parasite decorates some meadows southeast of Fleetwood.

Thalesia uniflora (L.) Britton. Frequent. Specimens of this yellowish root-parasite have been found in a number of places in the county.

Triosteum angustifolium L. Rare. This plant is much scarcer in this locality than its sister species, *T. perfoliatum*. Specimens were found near Moselem.

FUNGI

Sparassis Herbstii Peck. This handsome fungus was named by Prof. C. H. Peck after the late Dr. William Herbst, of Trexlertown, Pa. Specimens have been found in open woods near Pricetown, Pa.

Hydnum Caput-ursi Fr. The only specimen ever seen by the writer was found on an oak stump near Moselem.

Hydnum coralloides Scop. A beautiful specimen of this fungus was found at Moselem, by Mr. S. S. Gruber and presented to the writer. It grew from a dead hickory stump about four feet from the ground.

Cordyceps herculea Schw. Specimens of this interesting parasitic fungus were found in rich woods at Moselem and identified by Prof. C. H. Peck.

Polyporus frondosus Fr. A fine specimen of this fungus was found near Fleetwood. It was in the form of a spherical cluster about one foot in diameter.

FLEETWOOD, PA.

A NEW MAPLE FROM SOUTHERN CALIFORNIA

BY LE ROY ABRAMS

A few years ago Dr. E. L. Greene (Pittonia, **5**: 1–3) described four new species of *Acer* as segregates of *Acer glabrum* Torr. Three of these species we have been able to examine, and from

the specimens at hand we are convinced that the characters hold well geographically, although more complete material may prove that they intergrade. In addition to these apparently good species there is another maple of this group growing in the moun-

FIGURE 1. Photograph of a branch of *Acer bernardinum* Abrams, about three-eighths of its natural dimensions.

tains of southern California which cannot be placed with any of the described species. Specimens of this geographically isolated maple have been known to us for several years, but we have hesitated to describe the species, hoping that we might be able to study the plants in the field. The prospects, however, of a field acquaintance being still uncertain we shall describe the species from the available material, which was collected by Mr. S. B. Parish (*5128*) in Snow Cañon, 6,500 feet altitude, San Bernardino Mountains, June 20, 1901.

Acer bernardinum sp. nov.

A low bushy shrub, 15–20 dm. high; branches slender, with smooth whitish-gray bark. Leaves 15–25 mm. broad and about the same length, cordate at base, 3-lobed to near the middle; central lobe as broad as long, with 2 shallow tooth-like lobes, these with 2–3 short teeth; petioles slender, 10–12 mm. long. Fruiting pedicels 1–3, 9–12 mm. long; samaras strongly divergent.

Nearest related to *Acer Torreyi* Greene, but distinguished by its much smaller and less incised leaves, shorter petioles, and whitish-gray instead of reddish twigs.

Leland Stanford Jr. University.

SHORTER NOTES

Botrychiums in Sand. — The bay of Seven Islands is on the north coast of the Gulf of St. Lawrence, about three hundred and twenty-five miles below Quebec, or nearly half way from that city to the straits of Belle Isle. The western shore of the bay and the islands which fringe its mouth are composed of felspathic rock, but the eastern shore is a continuous stretch of sand. This sand region follows down the bay to the mouth, about four miles, and then keeping the configuration of the coast bends to the east and extends at least as far as Moisie, the next settlement, eighteen miles away. Inland, the soil, if it can be so termed, consists of sand dune after sand dune of no great height, the whole thus forming a belt of sand nearly twenty miles long and at first at least four miles wide, with no trace of rock in the parts about to be discussed, and probably with none anywhere.

At the eastern entrance to the bay I was surprised to find last

August no less than three species of *Botrychium* growing in the sand, just beyond the beach. They were never within reach of the salt water, but were however most abundant only about ten yards above the reach of ordinary high tides, where they must be exposed to spray during storms. In other terms, they were among the plants which formed the first fringe of vegetation along the coast, excepting those which actually grew on the beach, and these were very few. By far the most common species was *B. neglectum* Wood, the others were, *B. lanceolatum* (Gmel.) Ångs., and *B. Matricariae* (Schrank) Spreng. In the course of seventeen days spent in this general region, on shore and on the islands, I did not find elsewhere either of the first two species, and of the last only three plants together, on a rocky point at the head of the bay. At the place where the Botrychiums were found, I was nowhere far from the shore, but in other places I was far inland and never found any trace of these species, except as stated. All the material collected was submitted to Professor L. M. Underwood for specific determination. Professor M. L. Fernald has since informed me that he has on several occasions found Botrychiums in similar situations on the south shore of the Gulf.

C. B. Robinson.

New York Botanical Garden.

Schreiner and Reed on Deleterious Excretions by Roots. — In the June issue of the *Bulletin of the Torrey Botanical Club* Messrs. Schreiner and Reed contribute the results of a very interesting series of experiments which were designed to test the existence or otherwise of obnoxious substances excreted from the roots of plants. If I venture to draw attention to what seems to be a fallacy, I trust it may not be considered as carping criticism. For not only is their method of experiment ingenious, but it must be generally admitted that there is a very real problem to be solved regarding the relation of one field crop to another. The fallacy to which I draw attention is this : The authors designed their apparatus so that if a substance should form about the roots, it might have an opportunity of diffusing from its more concentrated solution about the roots into a larger body of the

nutrient medium (agar) in the lower part of the apparatus. For this purpose they employed the segmented tubes. At the lower end of the first tube, the substance might diffuse into the surrounding medium; but they assume that the concentration of the toxic substance would be greater in the succeeding tube than in the surrounding medium. This however would not be the case. From the lower end of the first segmented tube as a radius, the substance would diffuse *radially uniformly in all directions* and the concentration in the second tube would be equal to that in the general body of the medium; this state would be altered only *after the roots had commenced to develop in the second tube*. Hence at the time when the roots commenced to grow outside of the general alignment of the tubes, there could be no difference in the concentration of the toxic substance to account for the lateral development.

J. Walter Leather.

Agricultural Research Institute,
Pusa, Bengal.

PROCEEDINGS OF THE CLUB

October 8, 1907

The first autumn meeting for the year 1907 was held at the American Museum of Natural History. The meeting was called to order at 8:30 by the secretary, and Dr. E. B. Southwick was elected chairman. Eleven persons were present.

The minutes for the preceding meeting, on May 29, 1907, were read and approved, and the name of Dr. Forrest Shreve was presented for membership. The resignation of Miss Edith B. Brainerd was read. On motion the secretary cast the vote of the club electing Dr. Shreve to membership.

The announced program consisted of informal reports upon the summer's work and observations. In response to calls by the chairman the following members made remarks:

C. Stuart Gager: Remarks on the absence of undergrowth in a hemlock forest.

Hemlock seeds germinate freely under the parent trees, but seldom attain a height of more than three or four inches. It

was suggested that there may be present in the soil a substance or substances secreted by the hemlock roots and deleterious to the germination and growth of hemlock seedlings. This, as well as poor insolation, must be considered in attempting to explain why the seedlings fail to develop.

M. A. Howe: Botanical observations made in Pownal, Vt.

Dr. Howe reported his attendance at the annual summer field meeting of the Vermont Botanical Club, which was held in Pownal, the extreme southwestern township of Vermont. In this town are the only known Vermont stations for *Liriodendron Tulipifera*, *Morus rubra*, *Aster sagittifolius*, and several other species of interest.

C. B. Robinson: Plant studies on the northern coast of the Gulf of St. Lawrence.

Dr. Robinson had spent the first two or three weeks of August at Seven Islands, on the northern coast of the Gulf of St. Lawrence, about 325 miles below the city of Quebec. The coast to the east of the bay of Seven Islands is a nearly level sandy plain, but the western side, and the islands across the mouth, are formed of steep crystalline rock, a kind of feldspar. A range of hills attaining 1,700 feet in height runs parallel with the coast about ten miles inland. With the exception of a few plants like *Sibbaldiopsis tridentata*, *Empetrum nigrum*, and *Achillea Millefolium*, the rocks and the sand bore strikingly different floras. There was a tendency in some cases for the species of the woods to invade the sand, bringing there species like *Linnaea americana*, *Moneses uniflora*, and *Peramium ophioides*. Three species of *Botrychium* grew in still more open places on the sand. The flora, at best a scanty one, is particularly poor in trees. The shores are lined by black spruce, and the white spruce is less common. Beginning a short distance from the shore the sand plain becomes a pine barren, with *Pinus Banksiana* as practically the only tree. Two species of paper birch, the fir, larch, aspen, and mountain maple are the only other real trees. It had been hoped that the higher latitude would sufficiently compensate for altitudes lower than those of the hills of Gaspé, and thus give a flora comparable to that of the latter. A few such species

were found, among them *Diapensia lapponica*, *Vaccinium ovalifolium*, *V. uliginosum*, *Comandra livida*, *Euphrasia Randii*, and *Selaginella rupestris*, but the general results in this respect were distinctly disappointing.

W. D. Hoyt: Experiences at the Biological Laboratory of the U. S. Bureau of Fisheries, at Beaufort, N. C.

An account was given of the excellent equipment of the station, and the facilities for research. The richness of the local fauna and the varied flora were noted. The locality abounds in epiphytic plants of numerous species. The speaker's investigations indicate a local algal flora that compares favorably with that of the New England and the Florida coasts. Over 100 species have been found. The latitude of Beaufort appears to be the northern limit of certain southern species and the southern limit of some northern ones. The predominant flora varies greatly, according to the season, southern forms predominating in summer and northern forms in winter.

About 23 miles off the coast and under a depth of 13–14 fathoms, extending about one mile in length and one-half a mile in width, is probably the most northern of the coral reefs. It supports a rich algal flora, consisting almost entirely of southern forms, some of them new to North America.

Miss Pauline Kauffmann: Remarks on the unusual habitats of certain ferns in New Jersey.

Several species have been observed growing in habitats somewhat unusual for the species.

Homer D. House: Observations in western South Carolina, and on the Isle of Palms.

On the Isle of Palms, which is off the coast of South Carolina, several species new to South Carolina, and a probably new species of *Helianthus*, were found.

Tracy E. Hazen: Account of a visit to the experimental garden of President Brainerd, at Middlebury, Vt.

A description was given of President Brainerd's experimental pedigreed cultures of violets. In addition to the remarks concerning the Mendelian studies in *Viola*, attention was called to the fact that, contrary to the general notion, viable seeds were commonly found in the petaliferous flowers of the violet.

Discussion followed the remarks of each speaker.

The Club adjourned at 9:45.

C. STUART GAGER,
Secretary.

NEWS ITEMS

Dr. John Hendley Barnhart has been appointed librarian of the New York Botanical Garden, succeeding Miss Anna Murray Vail, who has felt obliged to give up the position on account of ill health.

Dr. Raymond H. Pond, who has been studying during the past year at the New York Botanical Garden, sailed for Europe on November 7 with the intention of spending several months in visiting German botanical laboratories.

Dr. William A. Murrill, first assistant of the staff of the New York Botanical Garden, visited the Biltmore Forest School, at Biltmore, North Carolina, in October, where he secured collections of Polyporaceae and made some observations on diseases of trees.

In the series of non-technical lectures at Columbia University, descriptive of the achievements of science and modern scholarship, recently inaugurated for the academic year 1907–08, the science of botany will be represented by Professor Herbert M. Richards, whose lecture will be given at 4:10 P. M., December 4, at Havemeyer Hall.

The botanical exploration of the Bahama Islands by the New York Botanical Garden and the Field Museum of Natural History is being continued by an expedition which left New York on November 15. The party, consisting of Dr. Marshall A. Howe and Mr. Percy Wilson, expects to visit some of the southeastern islands of the archipelago.

Dr. Ezra Brainerd, who is well known to botanists by reason of his notable studies of the species of *Viola* and by his additions to the knowledge of the flora of Vermont, has resigned the presidency of Middlebury College, to take effect at the end of the present academic year, when he will have completed forty-four years of service as an officer of that institution, during twenty-three years of which he will have been its president.

TORREYA

December, 1907

Vol. 7. No. 12.

LEUCOLEJEUNEA, A NEW GENUS OF HEPATICAE

By Alexander W. Evans

In the writer's paper on the Lejeuneae of the United States and Canada* three species are referred to the genus *Archilejeunea* and are described and figured under the names *A. clypeata* (Schwein.) Schiffn., *A. Sellowiana* Steph., and *A. conchifolia* Evans. While the close relationship which these species bear to one another is emphasized, attention is called to the fact that they present a number of peculiarities which are not shared by typical members of *Archilejeunea*, and the propriety of retaining them in this genus is questioned. A thorough study of several *Archilejeuneae* from tropical America, where the genus attains its highest development, soon made it evident that the importance of the aberrant characters exhibited by *A. clypeata* and its allies had not been overestimated, and it now seems advisable to separate them generically from *Archilejeunea* and to propose a new genus for their reception. This may be characterized as follows:

Leucolejeunea gen. nov.

Lejeunea *p. p.* G. L. & N. Syn. Hep. 1845.

Lejeunea, subgenus Archi-Lejeunea *p. p.* Spruce, Hep. Amaz. et And. 1884.

Archilejeunea *p. p.* Schiffn. in Engler and Prantl, Nat. Pflanzenfam. 1^3: 130. 1895.

Plants medium-sized to robust, pale-green or glaucous, neither glossy nor pigmented but sometimes becoming brownish with age or upon drying: stems prostrate, copiously and irregularly branched, the branches prostrate or slightly separating from the substratum, similar to the stem: leaves loosely to densely imbri-

* Mem. Torrey Club 8: 113–183. *pl. 16–22.* 1902.

[No. 11, Vol. 7, of Torreya, comprising pages 209–224, was issued November 19, 1907.]

cated, the lobe widely spreading but scarcely falcate, ovate-oblong to subrotund, more or less convex and often revolute at the rounded to very obtuse apex and along the postical side, margin entire or subdenticulate from projecting cells; lobule inflated throughout, the free margin more or less strongly involute to or beyond the apex, the opening into the water-sac being largely formed by the sinus, apical tooth varying from blunt to long-acuminate, hyaline papilla marginal, borne at the distal base of the apical tooth and more or less displaced from the terminal cell; leaf-cells plane or convex, thin-walled or with the free outer walls a little thickened, trigones small, mostly triangular with concave sides, intermediate thickenings occasional or rare; ocelli none: underleaves distant to imbricated, orbicular to reniform, entire, broad and undivided at the rounded apex, abruptly narrowed to subcordate at the base: inflorescence mostly autoicous: ♀ inflorescence sometimes borne on a short branch, sometimes on a leading branch, innovating on one side or occasionally on both, the innovations mostly short and sterile but sometimes again floriferous; bracts similar to the leaves, unequally bifid and complicate, the keel mostly rounded but sometimes narrowly winged; bracteole free, rounded to slightly retuse at the apex, obovate; perianth obovoid, scarcely compressed, rounded to subretuse at the apex with a distinct beak, five-keeled, antical keel low and sometimes indistinct, lateral keels sharp, postical keels rounded to sharp, keels smooth or minutely and irregularly crenulate or denticulate from projecting cells, rarely obscurely winged: ♂ inflorescence occupying a short branch; bracts mostly two to six pairs, imbricated, strongly inflated, slightly and subequally bifid with rounded lobes and a strongly arched keel, diandrous; bracteoles similar to the underleaves but smaller, limited to the base of the spike. (Name from λευκὸς, white, and *Lejeunea*, in allusion to the pale color of the plants.)

In distinguishing *Archilejeunea* and *Leucolejeunea* from each other the most important of the differential characters are those derived from the vegetative organs and the antheridial spikes. The species of *Archilejeunea*, for example, show a marked distinction between a creeping caudex and secondary stems, whereas in *Leucolejeunea* no such distinction is apparent. In *Archilejeunea* the plants are more or less pigmented, the hyaline papilla of the lobule is borne at the proximal base of the apical tooth, the trigones of the leaf-cells are large and conspicuous, the intermediate thickenings are scattered throughout the lobe, and the

pits are narrow. In *Leucolejeunea*, on the contrary, there is no pigmentation, the hyaline papilla is borne at the distal base of the apical tooth, the trigones are small, the intermediate thickenings are few and far between (except sometimes at the base of the lobe), and the pits are wide. The antheridial spikes in *Archilejeunea* are terminal or intercalary on leading branches and the bracteoles are borne throughout their entire length, while in *Leucolejeunea* the spikes occupy short branches and the bracteoles are limited to the base. In both genera the leaves are rounded to very obtuse at the apex, the underleaves are undivided, the female branch bears one or two subfloral innovations, and the perianth is five-keeled.

It is probable that *Leucolejeunea*, in spite of its undivided underleaves, bears a certain relationship to the genera *Cheilolejeunea* and *Pycnolejeunea* of the Lejeuneae Schizostipae. In some cases it resembles them so strongly in habit and general appearance that it is difficult to distinguish it from them in the field. It differs from *Cheilolejeunea* in its five-keeled perianth and in the structure of the lobule, the hyaline papilla although distal being displaced into the sinus. In *Pycnolejeunea* the papilla is proximal in position.

In addition to the three species already mentioned, *Lejeunea xanthocarpa* Lehm. & Lindenb. and *Lejeunea rotundistipula* Lindenb. may be safely referred to *Leucolejeunea*. The genus is most at home in the tropics, but its range extends well into temperate regions. The first species given below may be designated the type of the genus.

Leucolejeunea clypeata (Schwein.)

Jungermannia clypeata Schwein. Spec. Fl. Amer. Sept. Crypt. Hep. 12. 1821.

Lejeunea clypeata Sulliv. in Gray, Manual, Ed. I. 685. 1848.

Archilejeunea clypeata Schiffn. in Engler & Prantl, Nat. Pflanzenfam. 1^3: 130. 1895.

On rocks and trees. Massachusetts and New York, south to Georgia and Louisiana.

Leucolejeunea unciloba (Lindenb.)

Lejeunea unciloba Lindenb. in G. L. & N. Syn. Hep. 331. 1845.

Lejeunea (*Archi-Lejeunea*) *unciloba* Spruce, Hep. Amaz. et And. 91. 1884.

Archilejeunea unciloba Schiffn. in Engler & Prantl, Nat. Pflanzenfam. **1**[3]: 130. 1895.

Archilejeunea Sellowiana Steph. Hedwigia **34**: 62. 1895.

On trees and rocks. Rhode Island and Delaware, south to the West Indies, Texas, Mexico, and Brazil.

Within recent years the *Lejeunea unciloba* of Lindenberg has been variously interpreted. Spruce referred to this species a rather robust plant which he had collected in the vicinity of the Amazon. Stephani considered this an error and renamed Spruce's specimens *Archilejeunea Spruceana*.* At the same time he transferred the name *unciloba* to the *Lejeunea* (*Archi-Lejeunea*) *florentissima* of Spruce, thereby reducing this latter species to synonymy. During the past summer the writer had the privilege of examining the specimens of *Lejeunea unciloba* preserved in the Lindenberg herbarium at Vienna, including the material from which the original description was drawn. This study led to a third interpretation of the species. *Lejeunea unciloba* is represented in the Vienna collection by seven specimens, numbered consecutively from 6230 to 6236. These specimens came from the following stations: *6230*, locality not given, *Moritz*; *6231*, Peru; *6232*, Colipa, Mexico, *Liebman*; *6233*, Mirador, Mexico, *Liebman*; *6234*, Brazil (the type material); *6235*, Paramaribo, Dutch Guiana, *Kegel*; *6236*, Mirador, Mexico, *Liebman*. Of these numbers *6235* is marked with an interrogation point and is evidently distinct from the others. It agrees with *Lejeunea florentissima* Spruce and should be referred to this species rather than to *Lejeunea Auberiana* Mont., as Stephani has done.† The other specimens apparently agree with one another, although *6230* and *6231* are in poor condition and make a positive decision on this point impossible. Fortunately the numbers from Brazil and Mexico are more satisfactory and show that *Lejeunea unciloba*

* Hedwigia **34**: 62. 1895.

† L. c. **29**: 21. 1890.

is distinct from both *Archilejeunea Spruceana* and *Lejeunea florentissima.* It agrees, however, in all essential respects, with *Archilejeunea Sellowiana* Steph., a species which was also originally described from Brazilian specimens. It therefore becomes necessary to reduce this latter species to synonymy as indicated above.

Leucolejeunea conchifolia (Evans)

Archilejeunea conchifolia Evans, Mem. Torrey Club **8**: 128. *pl. 17, f. 1–9.* 1902.

On trees. South Carolina to Florida and Alabama.

Leucolejeunea xanthocarpa (Lehm. & Lindenb.)

Jungermannia xanthocarpa Lehm. & Lindenb. in Lehmann, Pug. Plant. **5**: 8. 1832.

Lejeunea xanthocarpa Lehm. & Lindenb. in G. L. & N. Syn. Hep. 330. 1845.

Lejeunea (*Archi-Lejeunea*) *xanthocarpa* Pears. Christiania-Vidensk.-Selsk. Forh. **1887**[9]: 4. *pl. 1, f. 14–24.*

Archilejeunea xanthocarpa Schiffn. Conspect. Hepat. Archip. Indici 316. 1898.

On trees. Mexico and the West Indies, south to Peru and Brazil (the type locality); Fernando Po, Mount Kilimanjaro, and Cape Colony; Java. This species will soon be fully described by the writer in another connection.

Leucolejeunea rotundistipula (Lindenb.)

Jungermannia rotundistipula Lindenb. in Lehmann, Linnaea **4**: 360. 1829.

Lejeunea rotundistipula Lindenb. in G. L. & N. Syn. Hep. 331. 1845.

Lejeunea (*Archilejeunea*) *rotundistipula* Steph. Hedwigia **29**: 21. 1890.

Apparently on trees. Known only from Cape Colony, the type-locality. Judging from the original specimens in the Lindenberg herbarium, this species is dioicous; in other respects it shows a close approach to *L. unciloba.*

Yale University.

AN UNDESCRIBED HELICONIA IN THE NEW YORK BOTANICAL GARDEN

By Robert F. Griggs

Bihai geniculata sp. nov.

Plant about 4 m. tall (stem to base of peduncle 2 m., petiole 4–6 dm., blade 12.5 dm.), erect, with the habit of *B. Champneiana* but with only 2–3 leaves to a stalk at a time. Leaf 120–150 cm. long, about 30 cm. wide, oblique, narrowed or rounded at the base, acute or suddenly very short-acuminate at the tip, green and glabrous, main veins 10–13 mm. apart. Inflorescence 20–30 cm. long, red, erect, sessile or on a peduncle up to 15 cm. long, of 9–10 bracts, which are of very unequal ages so that the flowers in the lower are in fruit before the upper open. Rachis nearly straight, stiff, the whole inflorescence including pedicels and flowers covered with a thin soft evanescent tomentum. Branch-bracts (distichous in the bud) becoming three-ranked by the twisting of the rachis, horizontally divaricate at anthesis, later reflexed, about 25 mm. apart; the lowest fertile one 15–25 cm. long, 3 cm. around at the widest part, the upper a little shorter, narrowly triangular, straight-sided, scarcely tapering to the very acute tip; the red of the rachis is continued onto the branch-bracts but they are paler at the base within and without and have an equilateral triangle of yellow, which appears on their sides near the point of attachment and extends nearly to the bottom when young, later disappearing so that they are entirely red after anthesis. Flowers 12–20 in each bract but of very diverse age, so that only about two are in season at once, closely appressed into the channel of the bracts until near anthesis, when they become erect by the upward bending of the pedicel, but quickly deflexed again by a sharp bend of about 90° appearing in the perianth above the ovulary, whence the name *geniculata;* free sepal always on the lower side after deflection and more strongly bent, forming a decided lip; pedicels and ovulary greenish-yellow, sepals yellow, as are the petals except for a bright patch of dark green on the lower edges of the two exposed by the reflexed lip.

The type is growing in the greenhouses of the New York Botanical Garden, *no. 19668*, and herbarium sheets are preserved in the same institution. Its native habitat is unknown. It came from the Department of Parks of the Borough of the Bronx in

FIGURE 1. *Bihai geniculata* Griggs.

1902, where it had been in cultivation for some time. It flowers in December.

Of the older species, *B. geniculata* is most similar to *Bihai brasiliensis* which, however, is smaller, has fewer, ascending, bracts, and quite differently colored flowers. *B. tortuosa* is the only other species known to have a three-ranked inflorescence, which is a character that may be of some taxonomic significance as it involves considerable rearrangement of the bracts, and the inflorescence has been supposed to be truly distichous. But unfortunately it is a character not at all adapted to be preserved in herbarium specimens, and only in those few cases where the species have been studied alive can we find out which are distichous and which three-ranked or irregular.

It is unfortunate that the habitat of the species has been lost track of. The geographical distribution of the various species may have some bearing both on taxonomy and on larger problems of plant geography because of the apparently limited means of distribution possessed by the plant. We have, however, by no means sufficient data on the various species of the group to make any generalizations as to distribution. A large number of the species are known from a single collection, while others, as for example *B. latispatha* and *B. psittacorum*, are so widely distributed and so common that they occur in almost every collection of the genus.

On this account I have thought it worth while to add notes of distribution from several collections which have come within my notice.

Bihai acuminata (Rich.). Near Izabol, Guatemala, alt. circ. 750 feet, *W. A. Kellerman*, Feb. 23, 1907. As nearly as one can tell from dried specimens this plant agrees exactly with *B. acuminata*, which has not previously been reported north of Colombia.

B. Champneiana (Griggs). Los Amates, Guatemala, alt. 295 feet, *W. A. Kellerman*, Feb. 23, 1907. Previously reported up to 4,000 feet. Like the type except for a greenish streak along the keel of the bracts.

B. Collinsiana (Griggs). El Palmar, dep. Quezaltenango,

Guatemala, alt. 2,300 feet, *W. A. Kellerman*, Feb. 11, 1906, *no. 5890*; Jan. 16, 1907, *no. 6073*. Has leaves less glaucous than the type, also more flowers to a bract. The flowers, which were wanting in the type, are lemon-yellow.

B. crassa (Griggs). Near Izabol, Guatemala, alt. circ. 750 feet, *W. A. Kellerman*, Feb. 23, 1907. Previously reported up to 3,000 feet.

B. elongata (Griggs). Monkey Hill, Panama, *Cowell, no. 17*. Previously known from Guatemala alone.

B. humilis (Jacq.). Santa Marta, Colombia, *H. H. Smith, no. 2551*, with the field note "Erect, 6–7 feet. Local on damp hillsides, generally in second growth or open forest 1,500–4,000 feet. Flowers, June–Sept. Specimen is from Don Amo. 2,000 feet. Flower greenish, bract red, edge above and apex green." This specimen has the typical short round leaves of *B. humilis* together with the brightly colored inflorescence just as figured by Jacquin.

B. pendula (Wawra). Volcano Santa Maria, Guatemala, alt. 4,500 feet, *W. A. Kellerman*, Jan. 19, 1907, *no. 6076*. Previously reported only from Brazil. These plants are close to the type except in size; instead of being 3 m. they are nearly 7 m. tall.

B. rostrata (Ruiz & Pavon). Bolivia, *Miguel Bang, no. 2568*. Typical.

B. spissa (Griggs). Huatusco, Mexico, alt. circ. 6,000 feet, *Fred. Mueller*, 1853, *no. 401*. This station is very far north and at a great altitude for a tropical plant.

Ohio State University,
Columbus, Ohio.

THE GENUS SHORTIA

By Homer Doliver House

The story of the elusive *Shortia galacifolia* of the southern Appalachian mountains is one of the most interesting chapters in American botanical history. The plant was discovered by Michaux more than a hundred years ago, but in fruit only, and remained unknown to other botanists until detected by Asa Gray in the Michaux herbarium in Paris in 1839. Upon his return to

America Dr. Gray made a journey through the mountains of North Carolina, but did not succeed in rediscovering the plant,* in spite of which, however, he described and named it after Dr. Short, in 1842. It was not until 1879 that it was rediscovered, and in the meantime not a few botanists had searched for it in vain. The rediscovery was made by M. E. Hyams, in McDowell County, North Carolina, but this station was soon exterminated. In 1886, Professor C. S. Sargent and Mr. F. E. Boynton discovered a new station for the plant on the headwaters of the Keowee River, and in the spring of 1887 Mr. T. G. Harbison, after a careful exploration of the region, found it in great abundance in several localities in the Jocassee Valley and especially along the Whitewater and Toxaway creeks in South Carolina. In spite of its abundance in localities, its distribution is extremely limited, and its ornamental value, which has made it one of the important plants of American horticulture, might easily lead to its extermination. As the plant is now common in nurseries and can be obtained cheaply, it is probably not in immediate danger.

The name of the plant, fittingly commemorative of the name and botanical work of Dr. Short, unfortunately cannot be maintained, as there exists a previously named genus *Shortia*, published by Rafinesque, in an obscure publication, Autikon Botanicon, of 1840. Rafinesque bases his genus *Shortia* upon *Arabis dentata*.

Mr. W. L. Sherwood, of New York, has about 12,000 plants of *Shortia galacifolia* growing upon his place at Highlands, North Carolina, where Mr. Harbison is horticulturist. Mr. Sherwood's unique and valuable library of botanical works has been of considerable help to the writer upon many occasions, and in renaming the genus it seems fitting to dedicate it to him.

In addition to the present species, there exist three other members of the genus in China and Japan.

Sherwoodia nom. nov.

Shortia Torr. & Gray, in Am. Journ. Sci. I. **42** : 48. 1842.— II. **45** : 402. 1868. Proc. Am. Acad. **8** : 246. Syn. Fl. N. Am. **2** : 53. 1878.

Not *Shortia* Raf. Autikon Botanikon 16. 1840.

Sherwoodia galacifolia (Torr. & Gray) nom. nov.

Shortia galacifolia Torr. & Gray, in Am. Journ. Sci. I. **42**: 48. 1842.

The story of this species is given by C. S. Sargent, together with an illustration, in *Garden & Forest* for December, 1888; by Geo. Vasey in the First Report of the Secretary of Agriculture, 387, *pl. 11.* 1889; and by Alice Lounsberry in Southern Wild Flowers and Trees. 1901.

Sherwoodia uniflora (Maxim.) nom. nov.

Schizocodon uniflorus Maxim. Bull. Acad. Petersb. **12**: 71. 1868.
Shortia uniflora Maxim. l. c. **16**: 225. 1871. W. Wats. in Bot. Mag. *pl. 8166.* 1907.

Native of Japan. Duplicate types, collected by *Maximowicz* in prov. Senano and Nambu, Nippon, are in the Columbia University Herbarium.

Sherwoodia rotundifolia (Maxim.) nom. nov.

Schizocodon rotundifolius Maxim. l. c. **22**: 497. 1888.
Shortia rotundifolia Makino, in Tokyo Bot. Mag. **9**: 103. 1895.

Yayeyama Islands, Japan.

Sherwoodia sinensis (Hemsley) nom. nov.

Shortia sinensis Hemsley, in Hook. Ic. Pl. *pl. 2624.* 1899.

Menytze, Yunnan, China, *Henry 11490.* Duplicate type in the herbarium of the New York Botanical Garden.

New York Botanical Garden.

CRATAEGUS IN NEW MEXICO

By W. W. Eggleston

This group is scarce in this region, being found only in the mountains at high altitudes. The herbarium of the New Mexico Agricultural College contains *Crataegus rivularis* Nutt. and *Crataegus erythropoda* Ashe (*C. Cerronis* Nelson) from central New Mexico, which extends their range much farther south than previously reported. The surprising thing to me was a species of

the group Tenuifoliae. This group has not been known before west of the Mississippi River; but this discovery is only in line with facts recently ascertained in regard to the high altitudes of New Mexico, namely, that many of the plants of our northeastern flora, or closely allied species, occur there at altitudes above 2,400 meters. For this information I am indebted to Professor V. M. Spaulding, of the Desert Botanical Laboratory.

This species of the Tenuifoliae can be characterized as follows:

Crataegus Wootoniana sp. nov.

Leaves ovate, 2–4.5 cm. long, 1.5–4.5 cm. wide, acute at the apex, broadly cuneate or truncate at the base, serrate or doubly serrate with fine straight teeth and 3–4 pairs of broad acute straight lobes, membranaceous, glabrous, dull light-green above, paler below; petioles slender, 1–2 cm. long: corymbs many-flowered, glabrous; flowers about 1 cm. wide; calyx glabrous, calyx-lobes lanceolate-acuminate, entire, about 4 mm. long, pink, persistent, erect or spreading in fruit; stamens about 10; styles 3–4: fruit ellipsoidal, red, 6–10 mm. thick, 8–12 mm. long; nutlets usually 3, strongly ridged on the back, 5–7 mm. long; nest of nutlets 5–6 mm. thick. A shrub sometimes 3 meters high, armed with curved spines 2–4.5 cm. long, vegetative twigs glabrous, reddish-brown becoming ash-gray.

Specimens examined: *584*, *O. B. Metcalfe*, Mogollon Mts., on or near the west fork of the Gila River, Socorro Co., New Mexico; "Head of Little creek. Scarce. A shrub 10 ft. high, Aug. 23, 1903, 8,000 ft.;" type in the Gray Herbarium, cotypes (used in the description), sheets of the same number in the herbaria of the New York Botanical Garden, U. S. National Museum, and of the New Mexico Agricultural College; type of flowers, *182*, *Turner*, White Mts., Lincoln Co., New Mexico, North Eagle, 1 ½ miles above forks, May 22, 1899, 8,000 ft.

New York Botanical Garden.

REVIEWS

Punnett's Mendelism*

The first edition of this essay was printed in May, 1905, and the second revised edition in February, 1907. The outline of

* Punnett, R. C. Mendelism. Second Edition. Pp. viii + 85, *f.* 7. Cambridge: Macmillan and Bowes; London: Macmillan and Co., Ltd. 1907.

Mendel's theory is preceded by a brief biographical note on its author. In this edition some of the newer developments, such as Bateson's "Presence and Absence Hypothesis," the newer conception of "reversion," and the phenomena of "dihybridism," supplanting the older conceptions of synthesis and the compound allelomorph, are included, bringing the treatment quite up to date. The statement of the general theory is clear and interesting, its practical bearings are indicated, and in a "Note" at the end directions are given for those who may wish to repeat Mendel's experiments. The seven diagrams are specially helpful.

It seems unfortunate that a work, otherwise so admirable, should be marred by a botanical morphology long since abandoned. Thus, on pages 16, 17, and 82, the stamens are referred to as the "male" and the pistil as the "female" organs of the flower. On page 19 the pollen-grain is described as a "minute male cell" and homologized with the spermatozoön of animals; and again, on page 20, the zygote is said to develop into the adult organism by "a process of repeated nuclear division," omitting cell-division entirely.

With the exception of these minor points, it seems difficult to imagine how the work could have been done much better. Teachers, especially, should welcome the book most heartily.

C. Stuart Gager.

PROCEEDINGS OF THE CLUB

October 30, 1907

The meeting was held in the Museum Building of the New York Botanical Garden. The Club was called to order by the secretary at 3:55 o'clock, and Dr. John Hendley Barnhart was elected chairman. Twenty-two persons attended.

After the reading of the minutes for October 8, 1907, the following names were proposed for membership:

Mr. F. E. Fenno, Nichols, N. Y.; Mr. Morris Friedman, 2874 Briggs Ave., Bronx, N. Y. City; Miss Lillian Belle Sage, 34½ East 12th St., N. Y. City.

The question of omitting the regular meeting for November 27

(the day before Thanksgiving) was discussed, and a motion to omit that meeting was lost.

The resignation of Dr. William Austin Cannon was read and accepted, subject to the approval of the treasurer. On motion, the secretary cast the vote of the Club, electing to membership the persons proposed as above.

The following program was presented:

N. L. Britton: Botanical exploration in Jamaica.

Dr. Britton described his recent trip to the Island of Jamaica, where he with Mrs. Britton spent the month of September in exploring the south-central portion of Jamaica, in coöperation with Hon. William Fawcett, Director of Public Gardens and Plantations, and Mr. William Harris, Superintendent of Public Gardens. Collections aggregating about one thousand field numbers were made in the vicinity of Kingston, in the vicinity of Mandeville, on the Santa Cruz mountains and the Pedro plains lying between these mountains and the southern coast. The coast and morasses about Black River and Lacovia were examined; and another base was made at New Market, on the western border of the parish of St. Elizabeth, whence the hill country of the vicinity and of Eastern Westmoreland were explored. A stop was made also at Bluefields on the southern coast.

The region explored had been little collected in since the visit of William Purdie, an English collector sent to Jamaica from the Royal Gardens, Kew, in 1843 and 1844; and many species not collected by Mr. Harris in his recent work were obtained. Specimens of a considerable number of the more interesting trees and shrubs obtained were exhibited.

P. A. Rydberg: Remarks on the Water-weed, *Philotria*.

The genus was first described in Michaux's Flora Boreali-Americana under the name *Elodea*. Unfortunately this is antedated by *Elodes* Adanson. *Elodea* is characterized as having hermaphrodite flowers with three stamens and three bifid styles. Muhlenberg, in his catalogue, referred the plant to the Old World *Serpicula verticillata* L., now *Hydrilla verticillata*, and characterized the plant as being dioecious with 4-merous staminate flowers. Pursh, in his Flora, retains the plant in *Serpicula*, but

publishes it under a new specific name, *S. occidentalis*. His description agrees in every respect with that of Michaux, except that the leaves are described as linear, acute, and finely serrulate. Rafinesque, in reviewing Pursh's Flora in the *American Monthly Magazine*, criticized Pursh's treatment of the plant and proposed a new name *Philotria*, under which the plant is now to be known. Nuttall, in his Genera, proposes another new name *Udora*, and cites *Elodea* Michx. as a synonym, but describes the plant as being dioecious, the staminate flowers as having nine stamens and the pistillate as having three sterile filaments and three ligulate bifid stigmas. He added also: "flowers very small and evanescent, the female emerging; the male migratory, breaking off connection usually with the parent plant, it instantly expands to the light, the anthers also burst with elasticity and the granular pollen vaguely floats upon the surface of the water." Torrey, in the Flora of New York, describes *Udora* as being polygamous, the sterile flowers with nine stamens, the fertile ones with three to six stamens and cuneiform two-lobed stigmas.

How are these conflicting descriptions to be reconciled? Have some of the authors mentioned given erroneous descriptions? Are there more than one species which have been confused, or is *Philotria canadensis* such a variable plant both as to flowers and leaves? If there are more than one species, are they all polygamo-dioecious with three kinds of flowers: staminate with very short perianth-tube and nine stamens, pistillate ones with long tube and no stamens or merely rudimentary filaments, and hermaphrodite flowers similar to the pistillate ones but somewhat larger and with three to six stamens? These are questions to be answered, and botanists who have an opportunity to study the plants are invited to make thorough field study on these interesting water-weeds.

The study, as far as it has been done now, has given the following suggestions and conclusions, drawn mostly from the literature on the subject and from herbarium material. There seem to be more than one species, probably six or seven. As far as the material on hand shows, the plant with broad and obtuse leaves, originally described as *Elodea canadensis*, seems to be

hermaphrodite; the others all dioecious, not polygamous. The plant that is growing in Europe, supposed to have been introduced from America, and described as *Anacharis Alsinastrum* Babington, resembles *E. canadensis* in habit, but only pistillate flowers have been found, and in these the stigmas are entire. In the North American forms with dioecious flowers the staminate sheaths are sessile in the axils of the leaves and easily overlooked, except in the plant common in the Rocky Mountain region and one specimen from Tennessee, in which the sheaths are peduncled. In the Rocky Mountain plant the staminate flowers are apetalous.

The subject will be more fully discussed in a paper which Dr. Rydberg is preparing to publish in the *Bulletin* of the Club, as soon as more material has been consulted and certain questions can be answered more definitely.

Both papers were briefly discussed and adjournment was at 5:30 o'clock.

C. Stuart Gager,
Secretary.

November 12, 1907

The Club met at the American Museum of Natural History, November 12, 1907. The meeting was called to order by Dr. J. H. Barnhart. Dr. E. B. Southwick was elected chairman. In the absence of the secretary, Miss W. J. Robinson was elected secretary *pro tem.* Eleven persons were present.

After the minutes of the previous meeting were read and approved, the name of Mr. Bertram F. Butler was presented for membership.

The resignation of Dr. W. A. Bastedo was read and accepted, subject to the approval of the treasurer.

The secretary was instructed to cast the vote of the Club for the election of Mr. Butler to membership.

The following scientific program was presented:

Winifred J. Robinson: Demonstration of regeneration in *Drosera.*

Miss Robinson observed regeneration in the leaves of plants of *Drosera rotundifolia* which she had under observation for experi-

mental purposes, at the propagating house of the New York Botanical Garden, in August, 1907. Young plants appeared upon old and apparently dead leaves, which were attached to the plant and were at first thought to be seedlings that had penetrated the leaf-tissue in their growth. Sections showed that this was not the case, but that the young plant grew from the cells of the old tissue, which had remained in an embryonic condition. No formation of callus was observed. Regeneration occurred with equal facility from blade or petiole of the leaf or from the flower-stalk. The first leaves of the young plant bear no tentacles, but later leaves are exactly like those of the parent plant. The roots appear after the stem has attained some size and are at first diageotropic but later bend toward the substratum.

Drosera is not mentioned in recent literature upon regeneration, but Spencer, in his "Principles of Biology," 1867, referred to the subject as a matter of common knowledge. Naudin recorded the appearance of a bud upon the upper surface of the leaf of *D. intermedia* in Ann. Sci. Nat. II. **14**: 14. *pl. 1. fig. 6.* 1840. Planchon gave his observations upon certain "monstrous flowers" of *D. intermedia* in Ann. Sci. Nat. III. **9**: 86. *pl. 5 & 6.* 1853. His observations were verified by various later writers. The most extended study of regeneration in *D. rotundifolia* was made by Nitschke, professor at Westphalia, whose investigations were printed in the Bot. Zeit. **8**: 237, 239, 245. 1860. He studied plants in the bogs and observed that the age of a plant could be determined by the successive rings of young plants about it.

Photographs of regenerating plants and of sections showing the relation of the regenerating tissue to the parent plant were shown, also specimens in alcohol, demonstrating the origin of young plants from petiole and blade of leaf and from the flower stalk.

Norman Taylor: Notes on *Tumboa* (*Welwitschia*).

After a short account of the history and synonymy of *Tumboa Bainesii* (*Welwitschia mirabilis*), a general description of the mature plant was given. Attention was called to the peculiar characters of *Tumboa*, which is exogenous in the two cotyledons and the 2–4-merous perianth, endogenous in the parallel-veined leaves

and six stamens, angiospermous in the general structure of the flower, and gymnospermous in the naked ovule and typical "cone" flowers.

Particular mention was made of the seedling, of which there are two now growing at the New York Botanical Garden. In germination the two ligulate cotyledons appear first above the soil, followed by the two nepionic leaves at first erroneously supposed to develop into the only two leaves that the plant ever has during the conjectural one hundred years of its life, but this interpretation of the foliage was subsequently corrected in the Genera Plantarum. Photographs were shown illustrating the two cotyledons and also the position and character of the two nepionic leaves. The latter, which will subsequently develop into the long, tentacle-like leaves of the mature plant, are at first small and linear, springing up directly between the cotyledons, which they closely resemble, and at right angles to them. It was noted that sometimes these leaves were pressed close together, and at other times spread as far apart as possible; that is, they were prostrated on each side of the axis of the plant. From being thus flattened out on the soil they would gradually become erect and finally touch their inner surfaces together. In seeking an explanation of this peculiarity several ideas suggested themselves, the true one seeming to be that the movement of the leaves was a direct response to the presence or absence of water. When they were prostrate they were simply wilted, and it was the water that made them stand erect. On account of the typically xerophytic aspect of even these seedling leaves one would not suspect that they were wilted, there being no external evidence of any loss of turgidity, except the change of position above described.

E. L. Morris: Some recent species of *Plantago*.

Plantago is the genus of plants containing our common plantain. Probably these plants are by most people considered nothing more than weeds, but in contrast to these as weeds, there is a large group of species typically at home and indigenous in the semi-arid regions of our West and Southwest. The species were for a long time included under one name, a name which was applied originally to the South American species found only in Patagonia.

The speaker called attention to a series of sheets of some fifteen species, which he stated, were, until 1900, or a few years preceding, classified under the name of *Plantago patagonica* Jacquin, or to speak more definitely, since 1845 there had been but three specific segregations from this composite and decidedly variant group. One of these was described by Dr. J. K. Small, another by Miss A. M. Cunningham, and another by Dr. E. L. Greene. The misapplication of the name of Miss Cunningham's species to a specimen received in exchange led to the study of the group and the segregation of the species into two distinct types, those with relatively long and definitely acute bracts, in distinction from those with typically short and definitely obtuse or rounded bracts. Among the group of perennial species of the genus, reference was made to a species from Mt. Shasta, formerly included in a species typical of only the extreme Southwest. Reference was then made to a recent species from Alaska, characterized by the marked septation or partitioning of the leaf hairs. A most notable fact regarding this species is that the next important collection of it was made in Montana. It appears that no collections of this species have been made along the Rocky Mountain regions between the Yukon and Montana stations. The last group of species noticed was that belonging to the typical South American subgenus *Plantaginella*, represented there by several species. A species recently reported from Mexico belongs unquestionably to this group, though quite out of its formerly known range. The chief characteristic of this species is the uniflorate spike, which, preceding anthesis, is enclosed within a prominent sheathing bract. Then followed a brief discussion of variation in our common eastern species, the facts being noted that certain forms may soon require a segregation with the rank of species.

A brief discussion followed the presentation of each of the topics of the evening.

Adjournment was at 9:45 o'clock.

WINIFRED J. ROBINSON,
Secretary pro tem.

NEWS ITEMS

Lucien Marcus Underwood, Ph.D., LL.D., Torrey Professor and head of the Department of Botany in Columbia University, chairman of the Board of Scientific Directors of the New York Botanical Garden, vice-president of the Torrey Botanical Club and for five years (1898–1902) editor-in-chief of its publications, died on November 16, at the age of fifty-four years. Professor Underwood was eminent for his work on ferns, liverworts, and fungi, and he was well known to the readers of TORREYA.

About four acres of ground have been recently set apart as a botanic garden for the University of Chicago. This piece of ground is easily accessible from the Hull Botanical Laboratory and is to serve as a laboratory garden where experimental work may be carried on.

We learn from *Science* that by the will of Mrs. Sarah E. Potter, of Boston, Harvard University received in June a bequest of $50,000 to be used in connection with the Gray Herbarium and to be called the Sarah E. Potter endowment fund. "As one of a number of residuary legatees, the university has now received an addition to this endowment of $130,000."

Clark Hall, of the Massachussetts Agricultural College, the new building named after Colonel William Smith Clark, an enthusiastic botanist and one of the first presidents of the institution, was dedicated on October 2. Professor D. P. Penhallow, D.Sc., F.R.S.C., of McGill University, gave an address on "William Smith Clark: his place as a scientist and his relation to the development of scientific agriculture," and Professor John M. Tyler, Ph.D., of Amherst College, spoke on the subject "Reminiscences of Col. W. S. Clark."

INDEX TO VOLUME VII.

New names and the names of new genera and species are printed in **boldface type.**

TORREYA

A Monthly Journal of Botanical Notes and News

JOHN TORREY, 1796–1873

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

JEAN BROADHURST

Volume VIII.

NEW YORK

1908

Press of
The New Era Printing Company
Lancaster, Pa.

THE TORREY BOTANICAL CLUB

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Meetings the second Tuesday and last Wednesday of each month alternately at the American Museum of Natural History and the New York Botanical Garden.

PUBLICATIONS. Bulletin. Monthly, established 1870. Price $3.00 per year; single numbers 30 cents. Of former volumes only 24–33 can be supplied entire. Certain numbers of other volumes are available, and the completion of sets will be undertaken.

Memoirs. A series of technical papers published at irregular intervals, established 1889. Price $3.00 per volume.

Torreya. Monthly, established 1901. Price $1.00 per year.

All business correspondence relating to the above publications should be addressed to William Mansfield, Treasurer, College of Pharmacy, 115 W. 68th St., New York City.

ERRATA, VOLUME 8

Page 25, 2d line from bottom (footnote), *for* No. 2, *read* No. 1.

Page 54, 10th line, *for* yellew *read* yellow.

Page 60, 1st line, *insert* a hyphen at the end of the line.

Page 102, 3d line, for *matricariaefolium* read *neglectum*.

Page 125, last line (footnote), *complete the brackets*.

Page 155, last line, *for* successively *read* successfully.

Page 163, 12th line from bottom, *for* The problems *read* The progress.

Page 195, 10th line, *for* others *read* other.

Page 207, 12th line from bottom, *for* Lause *read* Lancelot.

Page 217, last line, *for* ew *read* New.

Page 218, 7th line, *for* OEningen *read* Oeningen.

Page 232, 6th line, *for* Karston *read* Karsten.

Page 233, 2d line from bottom (footnote), *for* Radioactivity and Life *read* "Radioactivity and Life".

Page 237, 2d line, *for* Linnaeus" *read* Linnaeus.

Page 237, 3d line, *for* Specific *read* "Specific.

Page 246, 5th line, *omit* comma *before* are.

Page 250, end of the 12th line from bottom, substitute comma for the period.

Dates of Publication

No. 1,	for January.	Pages 1–24.	Issued January 27, 1908.
No. 2,	February.	25–40.	February 26, 1908.
No. 3,	March.	41–64.	March 27, 1908.
No. 4,	April.	65–92.	April 29, 1908.
No. 5,	May.	93–124.	May 19, 1908.
No. 6,	June.	125–152.	June 30, 1908.
No. 7,	July.	153–180.	July 29, 1908.
No. 8,	August.	181–208.	September 1, 1908.
No. 9,	September.	209–232.	September 26, 1908.
No. 10,	October.	233–252.	October 22, 1908.
No. 11,	November.	253–276.	November 25, 1908.
No. 12,	December.	277–315.	January 6, 1909.

TORREYA

January, 1908

Vol. 8. No. 1.

THE PINE-BARRENS OF BABYLON AND ISLIP, LONG ISLAND

By Roland M. Harper

To the botanist who regards a habitat merely as a place where certain species of plants may be found, the pine-barrens to be described below possess few attractions, for their flora is not very rich, and nearly all the species are pretty widely distributed and well known. But to the phytogeographer every habitat that has not been too much disfigured by civilization is of interest, whether its plants are few or many, common or rare; so no apology is necessary for publishing the following notes.

The pine-barrens of Long Island are very easy of access, but they seem never to have been adequately described, chiefly for the reason given above. Brief references to them occur in some old historical works, such as B. F. Thompson's History of Long Island (1839), on page 16 of which is the following statement: "There is another extensive tract lying eastward from the Hempstead plains, and reaching to the head of Peconic Bay, composed so entirely of sand as to seem in a great measure incapable of profitable cultivation by any process at present known."

The first distinct published list of Long Island pine-barren plants seems to be that of Dr. N. L. Britton (Bull. Torrey Club **7**: 82. 1880), who selected from Miller & Young's flora of Suffolk County, N. Y. (published in 1874) 46 species which he had found in New Jersey and on Staten Island to be confined to the coastal plain, or nearly so. Essentially the same list was copied by Dr. Arthur Hollick in 1893 (Trans. N. Y. Acad. Sci.

[No. 12, Vol. 7, of Torreya, comprising pages 225–258, was issued January 16, 1908.]

12: 192), by Dr. S. E. Jelliffe in 1899 (Fl. L. I.,.xi–xii), and by Dr. J. W. Harshberger in 1904 (Proc. Acad. Nat. Sci. Phila. **56**: 605).

The pine-barrens of Long Island are almost confined to the southern half of Suffolk County, but extend a few miles westward into Nassau, mostly in the shape of isolated patches. Dr. W. C. Braislin (Abstr. Proc. Linn. Soc. N. Y. **17–19** (**1904–1907**): 94. O 1907) places "the western limit of the scrub pines" at Central Park, about three miles west of the county line, where there are perhaps three or four hundred acres of pine-barrens; but I have seen other unmistakable patches of the same vegetation two or three miles farther west, namely, between Hicksville and Westbury and also about half way between Merrick and Hicksville.

The pine-barren area corresponds approximately with that of the soil mapped as "Norfolk coarse sandy loam" in the soil survey report on western Long Island by J. A. Bonsteel and others (Field Operations of the U. S. Bureau of Soils for 1903). Like most other unglaciated portions of Long Island, it is almost perfectly flat, with a barely perceptible southward slope of about 15 feet to the mile. A few very shallow valleys containing brooks or creeks traverse it, generally from north to south. It lies entirely south of the newer or Harbor Hill moraine, but partly north of the older or Ronkonkoma moraine. The soil seems to be of the Columbia formation, one of the youngest of coastal plain deposits. Its chief constituents here are silt and coarse sand. Just why pines should predominate on the "Norfolk coarse sandy loam" and deciduous trees on some equally sandy soils similarly situated a little farther west is not clear. It cannot be altogether a matter of water-content, for the pines occur also well within the edges of the swamps.

In Babylon and Islip, the two westernmost townships on the south side of Suffolk County, pine-barrens are the prevailing type of vegetation, and as there are a good many square miles of them in these townships entirely uninhabited, they are in excellent condition for study. My observations on the flora of Babylon and Islip have been confined to three trips on foot

across the pine-barrens from north to south in the fall of 1907. On October 6 I traversed the pine-barrens of Islip in going from Smithtown to Babylon by way of Brentwood and Edgewood; five days later I went from Hicksville to Babylon (station) by way of Pinelawn, and on November 3 from Cold Spring station to Amityville, the latter half of this journey being also through the township of Babylon.

There seem to be only two natural types of vegetation in the region under consideration, namely, dry pine-barrens and swamps. The swamps are confined to narrow belts along the streams, and the only one I have examined is that of Santapogue Creek, two

FIGURE 1. Dry pine barrens about one-half mile south of Edgewood station (town of Islip), Oct. 6, 1907. Trees all *Pinus rigida*, the largest about 9 inches in diameter and 30 feet tall. Undergrowth almost entirely *Quercus ilicifolia* and *Q. prinoides* in equal proportions, about 4 feet tall. The picture embraces a horizontal angle of about 36°. This scene is typical of thousands of acres in both townships.

or three miles west of Babylon station. The dry pine-barrens are fairly uniform over many square miles, the principal natural variation being that toward the northern edge the shrubs are

smaller and the herbs more numerous than elsewhere. Southward the arborescent species of oaks become larger and more numerous and gradually crowd out the pines. The northern boundary of the pine-barrens seems to be more sharply defined.

The average appearance of the dry pine-barrens is illustrated better by the accompanying photographs * than it could be by any description. The pines are the dominant feature of the landscape, and the underbrush consists chiefly of a dense growth of two shrubby oaks,† all the individuals of both reaching approximately a uniform height in any one locality. The herbs are more numerous in species, but more scattered and inconspicuous. The dry pine-barrens have probably always been subject to occasional fires, which since the advent of civilized man have become frequent enough to kill a good many of the pines but otherwise have perhaps caused little change.

The species observed in this habitat in the two towns mentioned are as follows. They are divided first into trees, shrubs, and herbs, and then arranged approximately in order of abundance in each class.

TREES	HERBS
Pinus rigida	*Pteridium aquilinum*
Quercus alba	*Ionactis linariifolius*
Quercus coccinea	*Cracca virginiana*
Quercus stellata (*Q. minor*)	*Baptisia tinctoria*
Populus grandidentata	*Dasystoma pedicularia*
SHRUBS	*Solidago bicolor*
Quercus ilicifolia (*Q. nana*)	*Andropogon scoparius*
Quercus prinoides	*Solidago odora*
Comptonia peregrina	*Lespedeza hirta*
Pieris Mariana	*Sericocarpus linifolius*
Gaylussacia resinosa	*Helianthemum* sp.
(and others ?)	*Sericocarpus asteroides*

* None of the existing local floras of Long Island is illustrated, so far as known to the writer, so these may be the first photographs of Long Island pine-barren vegetation ever published.

† These two oaks are remarkably similar in appearance, considering that they belong to different sections of the genus. See in this connection Rehder, Rhodora 9: 61. 1907.

Vaccinium spp.	*Chrysopsis Mariana*
Smilax glauca	*Aster concolor*
Rhus copallina	*Epilobium angustifolium*
Arctostaphylos Uva-ursi	*Gaultheria procumbens.*

Besides these, *Aster spectabilis*, *Laciniaria scariosa*, *Lespedeza capitata*, and *Sarothra gentianoides* were seen along some of the roads, and they may perhaps also occur naturally in the pine-barrens. *Chrysopsis falcata*, which is commonly regarded as a typical northern pine-barren plant, I have found only on a gravelly hill in Smithtown,* and (abundantly) in gravel between the rails

FIGURE 2. Two scenes in the pine-barrens of Babylon, Oct. 11, 1907. At left, dry pine barrens about a mile south of Pinelawn. Pines growing more densely than usual. Oaks mostly *Q. ilicifolia*, four or five feet tall. At right, east edge of swamp of Santapogue Creek, looking south, just above the road from Farmingdale to Babylon. Shows principally *Pinus*, *Acer*, and *Betula*.

of an old railroad which runs eastward from Garden City, Nassau County. *Hudsonia ericoides*, another supposed pine-barren plant, I have seen only on a high gravelly hill in the southwestern part

* Most of the stations cited for it in Jelliffe's Flora of Long Island are on the north side of the island, among the hills.

of the town of Huntington, just north of Babylon. *Corema Conradii* may possibly occur somewhere in this region, for according to Mr. J. H. Redfield* it is associated, wherever it grows, with a good many of the species listed above.

The flora of the swamps is considerably richer than that of an equal area of dry pine-barrens. The single pine-barren swamp examined on October 11 contained the following species, some on its edges, some right in the stream, and some in intermediate positions.

TREES	HERBS
Acer rubrum	*Osmunda cinnamomea*
Nyssa sylvatica	*Dulichium arundinaceum*
Pinus rigida	*Carex stricta*
Betula populifolia	*Osmunda spectabilis* (*O. regalis*)
SHRUBS	*Sparganium* sp.
Clethra alnifolia	*Lysimachia terrestris*
Alnus rugosa	*Eriophorum virginicum*
Myrica carolinensis	*Dryopteris Thelypteris ?*
Ilex glabra	*Panicularia canadensis*
Chamaedaphne calyculata	*Pteridium aquilinum*
Azalea viscosa	*Aster* sp.
Leucothoë racemosa	*Eupatorium verbenaefolium ?*
Xolisma ligustrina	*Andropogon corymbosus abbreviatus* †
Rhus Vernix	*Viola primulaefolia*
Kalmia angustifolia	*Solidago arguta ?*
Azalea viscosa glauca	*Habenaria ciliaris ?*
Ilex verticillata	*Lilium philadelphicum*
Cephalanthus occidentalis	*Sphagnum* sp.
Viburnum cassinoides	(and a few other mosses)
Spiraea salicifolia	

Chamaecyparis thyoides, which grows in some more or less similar swamps in Nassau County,‡ and *Polygala lutea*, which is

* Bull. Torrey Club 11: 97–101. 1884.

† Described in Britton's Manual 70. 1901. Formerly referred to the more southern *A. glomeratus* (Walt.) B.S.P. (*A. macrourus* Michx.).

‡ See Torreya 7: 198–200. O 1907.

said to have been found in or near this particular swamp, I did not see. *Magnolia glauca* (*M. virginiana*) might have been expected in such a place, but apparently it is not known from the western half of Long Island.

Nearly half the shrubs in both habitats are of the Ericaceae and closely allied families. The Compositae constitute nearly half the herbs noted in the uplands and a considerable proportion of those in the swamps; but more complete lists, including spring and summer flowers which become unrecognizable in the fall, would doubtless show a smaller proportion of this family. Evergreens other than pines are very scarce in the dry pine-barrens and not very numerous in the swamps.

The most interesting features of this pine-barren vegetation are brought out by a study of the geographical distribution of its components. For the sake of brevity the species of both habitats may be combined, since it happens that the geographical affinities of both are much the same.

Not one of the species whose identity is certain is confined to the coastal plain, though *Pieris Mariana*, *Clethra*, *Myrica*, *Ilex glabra*, and *Eupatorium verbenaefolium* are mainly so.* On the other hand, *Arctostaphylos*, *Betula populifolia*, and *Panicularia canadensis* are chiefly confined to the glaciated region. *Azalea viscosa*, *Leucothoë*, *Dulichium*, and *Eriophorum* are widely distributed both in the glaciated region and coastal plain, and also occur more rarely in bogs in the southern Alleghanies.† Nearly all the species are common in New England, especially in the southeastern portion.‡ At least one-third of the dry pine-barren plants are common to

* Nearly all the few endemic coastal plain species known from Long Island seem to be bog plants, confined for some reason not fully understood to the eastern half of the island.

† See Rhodora 7: 72–76. 1905. At that time I supposed *Dulichium* to be strictly confined to the glaciated region and coastal plain, but I have since noticed that it has been reported from the mountains of Kentucky by Kearney (Bull. Torrey Club 20: 479. 1893) and from Cullman County, Alabama, by Mohr (Contr. U. S. Nat. Herb. 6: 396. 1901).

‡ See Hollick, Bull. N. Y. Bot. Gard. 2: 381–407. 1902; Blankinship, Rhodora 5: 128, 129, 133. 1903. I have found most of them also in Worcester Co., Mass., and some of the most abundant species extend at least as far up as northern New Hampshire, according to Chittenden (U. S. Forestry Bull. 55: 69, 99. 1905).

the "jack-pine plains" of Michigan (though those are characterized by a different species of pine), according to Spalding * and Beal, † and many of the swamp plants or their near relatives are reported from the same general regions. ‡

Several of the characteristic dry pine-barren plants have been reported by Dr. Britton § from the mountains near the boundary between New York and New Jersey. Much the same flora, and essentially the same types of vegetation, are characteristic of at least some parts of the pine-barrens of New Jersey, judging from the excellent illustrations and descriptions by Hollick, Pinchot, and Gifford in the report on forests which accompanied the report of the state geologist of New Jersey for 1899.|| Farther south about half the species, or in some cases closely related forms, follow the coastal plain all the way to Florida, while a good many others are found in the South only in the mountains, where they grow on sunny slopes or in sandy bogs. Of the last-mentioned category are *Pinus rigida*, *Quercus ilicifolia*, *Q. prinoides*, *Comptonia*, *Populus*, *Gaultheria*, *Chamaedaphne*, *Kalmia angustifolia*, *Spiraea*, *Carex stricta*, *Lysimachia*, and *Lilium*.¶ The remainder are mostly of pretty wide distribution in temperate eastern North America.

About the time of the Glacial period, when the coastal plain is supposed to have been all under water, all these species must have been confined to the mountains and foothills between Pennsylvania and Alabama. When the glaciated region and coastal plain were again laid bare by the retreating ice and water these plants and their associates were doubtless among the first to take possession of the new territory. Their present rather disjointed

* Am. Nat. **17**: 249–259. 1883.

† Mich. Flora 16, 17. 1904.

‡ See Transeau, Bot. Gaz. **36**: 403, 404. 1903; **40**: 431–446. 1905.

§ Bull. Torrey Club **10**: 105. 1883; **11**: 126–128. 1884; **14**: 187–189. 1887. See also Harshberger, Proc. Acad. Nat. Sci. Phila. **56**: 606–609. 1904; Rep. 8th Int. Geog. Cong. 604, 605. 1905.

|| See also Lighthipe, Torreya **3**: 79–81. 1903.

¶ For notes on the occurrence of some of these in the southern mountains see Ashe, Bull. N. C. Geol. Surv. **6**: 213, etc. 1898; Small, Torreya **1**: 7, 8. 1901; Ashe & Ayres, Pres. Message So. Appalach. Region 93–109. 1902; Harshberger, Bot. Gaz. **36**: 379. 1903.

distribution has probably come about chiefly through the subsequent slow but sure encroachments of climax vegetation, on all the better soils.

College Point, L. I.

A TRIP TO JAMAICA IN SUMMER

By Elizabeth G. Britton

Starting for Jamaica on the twenty-fourth of August, after ten weeks of hot, dry weather in New York, does not seem to be an ideal way of spending a vacation; but the voyage there and back on the fine large steamships of the Royal Mail and three weeks in the open air collecting were a welcome and beneficial experience. Wakened at dawn by the rockets signalling for a pilot, it was a beautiful sight to see those glorious Blue Mountains loom dark and mysterious with the comet faintly visible above them, and to watch the change of colors on the water and hills as each familiar land-mark came into view. Since our last visit, the earthquake had laid Kingston in ruins; the cocoanuts at the end of the Port Royal peninsula stood in twenty feet of water and the wrecked steamships of the Hamburg-American line lay on the beach with their tragic history still unfinished. But as we neared our dock, it was but a step "from the sublime to the ridiculous," for there were those same negro boys diving for pennies, exactly as if nothing had happened. Kingston never was a picturesque city and it compared unfavorably with the capitals of any of the larger West Indian Islands; but it has now the dignity of sorrow and the hope of renovation. Many of the business streets are still a mass of tangled ruins, for the new shops are being built on vacant lots away from the water front. We found the trolleys and railroads running as usual and comfortable accommodations at the Constant Spring Hotel. We spent the day after our arrival at the Hope Botanical Gardens, where the blossoms of the *Poinciana* sprinkled the ground with red and the humming-birds darted in and out of the arbors of *Thunbergia grandiflora*; and we left by rail for Williamsfield early the following morning, reaching there in time to drive to Mandeville and

FIGURE 1. *Sabal umbraculifera* near Malvern, Jamaica.

do some collecting. Mandeville lies at an elevation of about 1,800 feet in a hilly region and is much frequented by tourists. There are several good hotels and many fine drives, as well as a

cool and comfortable climate. Wooded hills afford good collecting, and even the roadsides yield interesting species of orchids, bromeliads, mistletoes, and ferns.

But our destination was the Santa Cruz Mountains, where Purdie collected in 1843-44, in order to search for several long-lost species, so we secured a driver and carriage at Mandeville and the following afternoon reached Malvern Hill, where we were joined by Mr. Fawcett and Mr. Harris, whose kind assistance did much to make our trip successful. There is a land-mark on Malvern Hill, a palm eighty feet high, *Sabal umbraculifera*, with swallows darting around its crown of leaves and epiphytes growing on its trunk. All around are pimento trees, the berries of which were ripe, and the fragrance of allspice, drying on the barbecues, scented the air. We spent ten days here very comfortably, making trips both north and south along the ridge at elevations of 2,100-2,700 feet. At Potsdam there is a large school for boys with a private bit of natural woodland, where was found a very rare tree, *Peltostigma ptelioides*, and the star-shaped seedlings of one of the mistletoes, probably *Psittacanthus polyceps*. At Stanmore Hill was found another rare tree, seventy-two feet high, *Spathelia glabrescens*, recalling the "Pride of the Valley," *S. simplex*, which we had seen last year for the first time near Gordon Town. The stem in both species is slender and unbranched, with a crown of long pinnate leaves and a large panicle of brilliant pink flowers at the summit. One trip was made to the southeastern end of the ridge at Yardley Chase, where there is a magnificent view of the ocean from an elevation of 1,600 feet, at one point known as "Lover's Leap." The proprietor, Mr. Panton Forbes, offered us the use of his seaside cottage at Great Pedro Bay, where Dr. Britton and Mr. Harris camped out one night in a search for the long-lost cactus, *Mamillaria simplex*. Plenty of the Turk's-cap and several tall branching species of *Cereus* and *Pilocereus* as well as *Opuntia* were found, making a weird growth among the logwoods back of the sand dunes.

Leaving Malvern Hill for Black River, we descended to the sea-coast again and trips were made to the "honey-comb rocks" at Longacre and Luana Points in search of another palm with

prickly petioles recorded by Grisebach as *Copernicia tectorum.* This also was unsuccessful, though plenty of the silver-thatch palm was found at Ackendown. One of the special features of the trip was a drive to Lacovia, where through the courtesy of Mr. H. M. Farquharson fine specimens of a *Nelumbium* with yellow flowers were obtained. It is supposed to be the same as *N. luteum*, our wild yellow lotus of the United States, but its seeds are pointed at both ends, instead of round, and it has been called *N. jamaicense* DC. It was formerly more abundant than it is now, having been reported from several other stations on the island. Two trips also were made by boat up Black River, where several interesting trees and vines were found. The lowlands of this part of the island are filled with morasses and one unusual palm was obtainable only by wading in and sending a boy up for the leaves and fruit.

The last week of our stay was spent at New Market in the hills of Westmoreland, where the climate is more humid, fogs are frequent at night, and the mosses and ferns, in consequence, are more abundant. The road leading to Montego Bay was traversed twice and yielded an interesting epiphytic cactus of the genus *Rhipsalis* and one of the Gesneriaceae. Another visit during the winter would give a still richer harvest as the rainy season was beginning when we were there, making collecting and drying of plants a difficult matter. The region around Bluefields, also, where Gosse collected so many of the birds of Jamaica would repay further exploration.

We had intended to spend a week at the eastern end of the island, but having read Inspector Thomas's account of it in "Untrodden Jamaica" and learning from the government engineers that it rains three hundred days of the year and the other sixty-five it pours in the John Crow Mountains, which are known as the "Watering Pot of Jamaica," we concluded that it would be better to postpone our trip to them till we were specially prepared and await a more favorable season.

Altogether about 2,000 specimens were secured for the New York Botanical Garden.

New York Botanical Garden.

THE PINE-BARREN BELLWORT

By Kenneth K. Mackenzie

One of the least known of the many peculiar plants found in the pine-barrens of New Jersey is the pretty little bellwort described by Dr. Britton in 1889 (Trans. N. Y. Acad. Sci. **9**: 13) as *Oakesia sessilifolia* var. (?) *nitida*. Since its original collection at Tom's River and Cedar Bridge, it has also been found at Forked River, Lakewood, and Egg Harbor, all within thirty miles of the type station. In addition to its limited range, one reason for the lack of specimens of this species in collections probably is that at the time of its flowering in May the pine-barrens are poor collecting grounds and little explored.

Since its first description this plant has been referred by the late Rev. Thomas Morong (Mem. Torrey Club **5**: 111), together with other forms of *Oakesia*, to *Uvularia* as *Uvularia sessilifolia nitida*, and under this name it appears in the Illustrated Flora (**1**: 409). It is in this last-named work, too, where we first find a hint as to the true relationship of this bellwort, when we are told that it is "perhaps referable to the following species" (*Uvularia puberula* Michx.); and it is to emphasize the close relationship existing between this mountain bellwort (*U. puberula*) and our pine-barren plant that the present paper is written.

	U. sessilifolia	*U. nitida*	*U. puberula*
Capsule	Noticeably stipitate	Sessile, 17 mm. long	Sessile, 24 mm. long
Style	Slender, much exceeding the anthers	Slender, much exceeding the anthers	Thick, little exceeding the anthers
Leaves	Sessile, glaucous beneath, thin, not strongly reticulate-veined; margins entire or minutely serrulate	Subcordate, very green on both sides, thinnish, not strongly reticulate-veined; margins minutely serrulate	Subcordate, very green on both sides, thick, strongly reticulate-veined; margins serrulate
Stem angles	Essentially smooth	Essentially smooth	Serrulate and puberulent

During the last collecting season I had the good fortune to collect the pine-barren bellwort at Tom's River, not only in flower, but also later on in good fruiting condition. A study of this material and all other available collections has convinced me

that in the pine-barren bellwort we have a distinct species, which should be called **Uvularia nitida,** and which is much more closely related to *U. puberula* than it is to *U. sessilifolia.* The preceding table will show the chief differences between the three species.

From the above it may be noted that the differences between *U. nitida* and *U. sessilifolia* are very pronounced, while those between *U. nitida* and *U. puberula* are much more slight. This last-named species is variable, and incomplete specimens from the South, in the Columbia University herbarium, show a close approach to *U. nitida.* The species, however, as a rule, seem decidedly distinct, when represented by good specimens. The style character is apparently especially constant, although it may depend to some extent on the age of the flowers. As between *U. sessilifolia* and *U. puberula* this distinction is well shown in the Illustrated Flora (*figs. 988, 989*).

New York City.

A KEY TO THE WHITE AND BRIGHT-COLORED SESSILE POLYPOREAE OF TEMPERATE NORTH AMERICA — I

By William A. Murrill

Key to the Genera

Context white.
- Tubes hexagonal, arranged in radiating rows, context thin. — **A.** Hexagona
- Tubes mostly shallow, marginal and obsolete, hymenium hydnoid or irpiciform at a very early stage. — **B.** Irpiciporus
- Tubes normally poroid, sometimes irpiciform from the rupture of the dissepiments at maturity.
  - Hymenium at length separating very smoothly from the context. — **C.** Piptoporus
  - Hymenium not separating as above.
    - Pileus very soft, spongy and elastic throughout. — **D.** Spongiporus
    - Pileus more or less firm, flexible or rigid.
      - Context duplex, spongy above, firm below, surface sodden and bibulous. — **E.** Spongipellis
      - Context not duplex as above.
        - Pileus fleshy-tough to woody and rigid.
          - Surface anoderm, rarely zonate.
            - Hymenium more or less smoke-colored at maturity. — **F.** Bjerkandera

Hymenium white or pallid.

Context fleshy to fleshy-tough, friable when dry. **G.** TYROMYCES

Context punky to corky, not friable when dry. **H.** TRAMETES

Surface pelliculose, zonate. **I.** RIGIDOPORUS

Pileus thin, leathery and more or less flexible, surface usually zonate.

Hymenophore preceded by a cup-shaped body. **J.** PORONIDULUS

Hymenophore not as above.

Hymenophore normally pileate, tubes small and regular. **K.** CORIOLUS

Hymenophore semi-resupinate, tubes large and irregular. **L.** CORIOLELLUS

Context bright colored; some shade of yellow or red.

Pores red.

Context soft and spongy. **M.** AURANTIPORELLUS

Context firm.

Tubes unchanged on drying.

Tubes fragile, surface anoderm. **N.** PYCNOPORELLUS

Tubes firm and regular, surface pelliculose. **O.** PYCNOPORUS

Tubes orange-colored, becoming dark and resinous on drying. **P.** AURANTIPORUS

Pores yellow. **Q.** LAETIPORUS

A. THE SESSILE SPECIES OF HEXAGONA

1. Tubes unequally hexagonal, the radial walls longer. 2

Tubes equally hexagonal. *H. cucullata* (Mont.) Murrill

2. Tubes large; surface of pileus decorated with imbricated reddish-brown fibrils, which disappear with age. *H. alveolaris* (DC.) Murrill

Tubes much smaller, the mouths rarely over 1 mm. long and 0.5 mm. broad; surface of pileus glabrous. *H. striatula* (E. & E.) Murrill

B. THE SPECIES OF IRPICIPORUS

1. Teeth 1 cm. or more long, pileus usually large and thick. *I. mollis* (B. & C.) Murrill

Teeth less than 0.5 cm. long; pileus thin and shortly reflexed. *I. lacteus* (Fr.) Murrill

C. THE SPECIES OF PIPTOPORUS

Pileus compressed-ungulate, surface smooth, context thick, milk-white. *P. suberosus* (L.) Murrill

D. THE SPECIES OF SPONGIPORUS

Pileus 6–10 cm. broad, surface tomentose to glabrous, tubes large, lacerate. *S. leucospongia* (Cooke & Hark.) Murrill

E. The Species of Spongipellis

1. Pileus more than 1 cm. thick, usually large.	2
Pileus less than 1 cm. thick, small or medium.	*S. galactinus* (Berk.) Pat.
2. Tubes white or slightly discolored.	3
Tubes becoming very dark-colored and resinous.	*S. fissilis* (B. & C.) Murrill
3. Margin of pileus thick and rounded.	4
Margin of pileus thin, not rounded.	5
4. Tubes large, 1 mm. or more across.	*S. unicolor* (Schw.) Murrill
Tubes much smaller.	*S. occidentalis* Murrill
5. Surface conspicuously hairy.	*S. borealis* (Fr.) Pat.
Surface nearly glabrous.	*S. delectans* (Peck) Murrill

F. The Species of Bjerkandera

1. Hymenium smoke-colored when young, soon becoming black.	*B. adusta* (Willd.) Karst.
Hymenium pallid when very young, becoming blackish with age.	2
2. Tubes round, equal and rather thick-walled at maturity; plant not fragrant.	*B. fumosa* (Pers.) Karst.
Tubes angular, unequal, thin-walled and lacerate at maturity; plant fragrant.	*B. puberula* (B. & C.) Murrill

New York Botanical Garden.

SHORTER NOTES

Gymnadeniopsis nivea in Southern New Jersey.— While botanizing near Bennett, Cape May Co., N. J., July 24, 1907, in company with Mr. S. S. Van Pelt, I found a number of orchids growing in a very wet bog. While these were as yet only in early bud, I took them to be *Gymnadeniopsis nivea* on account of the slenderness of the leaves and the appearance of the old flower stalks, a few of which were still standing. Later trips to the spot by Mr. Van Pelt and others proved the correctness of my identification, so that I am now able to add this interesting species to the flora of New Jersey. On August 13 and September 4, it was in full bloom and was found also in several adjoining bogs. Another plant that occurred with it, unquestionably native, is *Boltonia asteroides*, heretofore known only as an introduced species in New Jersey.

Bayard Long.

Ashbourne, Pa.

Rynchospora rariflora in Southern New Jersey.— While visiting the station of *Gymnadeniopsis nivea* described by Mr. Bayard Long, on August 4, 1907, I discovered a patch of

Rynchospora which I failed to recognize and which proved to be *R. rariflora*, a species not previously reported from north of North Carolina, so far as I can ascertain. This adds one more to the list of southern plants that have recently been brought to light in the southwestern portion of the Cape May peninsula.

WITMER STONE.

ACADEMY OF NATURAL SCIENCES,
PHILADELPHIA, PA.

REVIEWS

Kellogg's Darwinism To-Day.*

This timely and welcome volume is intended "as a means of orientation in evolutionary matters for the general reader and for the unspecialized but interested student of science." The controversies instigated by the publication, in 1859, of Darwin's Origin of Species, have undoubtedly won complete victory, at least among scientists, for the theory of evolution; but strange as it may seem, these same controversies and the underlying investigations instigated by Darwin's work, have not resulted in establishing the validity of the particular method of evolution elaborated in the Origin. Quite to the contrary, as Kellogg says, "The fair truth is that the Darwinian selection theories, considered with regard to their claimed capacity to be an independently sufficient mechanical explanation of descent, stand to-day seriously discredited in the biological world." While several alternative and supplementary theories have been advanced, none of them has met with anything like a general acceptation, and Professor Kellogg well expresses our present *statu quo* when he says, "we are immensely unsettled."

In addition to winning the battle for evolution, by whatever method, the above-mentioned controversy has taught us the fundamental lesson that the question of method can never be settled by polemics, nor can the true process, or processes, ever be discovered in library or cloister, nor evolved out of our own inner consciousness. The recognition of this is a great step forward. The true method, or methods, of organic evolution

* Kellogg, Vernon L. Darwinism To-Day. Pp. xii + 403. Henry Holt & Co. New York. 1907.

can be ascertained only by observation and comparison of facts, the framing of hypotheses based upon those facts, and the deductive test of the hypotheses. Thus by a selection of hypotheses the fittest will survive. If Darwinism stands to-day seriously discredited as a sufficient causo-mechanical explanation of the fact of organic evolution, it is not on *a priori* grounds, nor because it is, as supposed by some, atheistic or at variance with the book of Genesis, but solely because, during the fifty years of its rigorous testing by application to fact, it has been found inadequate to explain all of the facts observed.

Not the least value of Professor Kellogg's book is its candid and, so far as space has permitted, adequate statement of both sides of the question, and of the other theories now struggling for recognition. Especially has the author rendered a service in putting Plate's arguments against natural selection into a form readily accessible to those who read German with difficulty, for Plate's work constitutes one of the strongest assaults against the Darwinian citadel.

On page 234, when the author says, "If, in a species, a number of individuals show a certain congenital variation, this variation will probably be lost by cross-breeding with individuals not having it, unless the individuals having it are in the majority or unless they become in some way isolated from the others so that they will breed among themselves," we are not sure from the context whether he is stating his own belief or merely the argument of the isolationists. In any event, there seems to be here a disregard of Mendelian light; and a treatment of the bearing of Mendelism on swamping by cross-breeding is not met with elsewhere in the book.

On page 330 the assertion, "Species-forming by sports and discontinuous variations is obviously (*sic*) no theory to presume to offer itself as a species-forming substitute for natural selection," seems strikingly intemperate in comparison with the treatment of other theories in the book. Not "obviously," by any means; and least so to those who have taken the pains to check up the results of field studies by experiments with pedigreed cultures. On page 377 the mutation-theory of de Vries seems to

the reviewer to be entirely misrepresented when it is said to "offer itself as an explanation of adaptation," and to be a "claimant for recognition as the great cause of descent." Unless I have entirely misunderstood de Vries, mutation was never put forward by him as an explanation of adaptation, nor as a "cause" of anything, but as a method only; the method of variation (by saltation) whose results are held most probably to furnish the material for natural selection (the great "sieve," as de Vries calls it) to act on. Adaptation, for the de Vriesian mutationist, as well as for the Darwinian, results from the survival of the fittest (because best adapted) in the struggle for existence. It were much nearer the truth to say that mutation offers an explanation for the lack of adaptation, *i. e.*, for the origin of characters that are not adaptive. It is on this point that the weakness of natural selection is greatly in evidence.

The last chapter is a kind of confession of faith, or scientific creed, of the author, in which he makes it more clear, if possible, than do the above quotations, that he is not a mutationist. "Darwinism," he says, "as the natural selection of the fit, the final arbiter in descent control, stands unscathed, clear and high above the obscuring cloud of battle. At least, so it seems to me. But Darwinism, as the all-sufficient or even the most important causo-mechanical factor in species-forming and hence as the sufficient explanation of descent, is discredited and cast down." The author urges us, "with Osborn," to "join the believers in the 'unknown factors in evolution,'" and inclines to a belief that there is "an automatic modifying principle which results in purposive change, that is, in the change needed as the indispensable basis for the upbuilding of the great fabric of species diversity and descent" (p. 387).

The reading of the book is rendered easier and more pleasant by the paragraph headings in heavy type, and less so by numerous lengthy quotations in German and French in the appendices to the chapters. The citations to original papers serve to render the book even more helpful and indispensable. All students of evolution-theories and kindred problems will warmly welcome it.

C. Stuart Gager.

PROCEEDINGS OF THE CLUB

November 27, 1907

The meeting was called to order at the museum building of the New York Botanical Garden at 3:45 P. M. by the secretary, and Dr. N. L. Britton was elected chairman. Nineteen persons were present. After the reading and approval of the minutes of the preceding meeting, the name of Mr. Edward N. E. Klein, College Point, L. I., was presented for membership.

The chairman made formal reference to the death of Professor Underwood, vice-president of the Club, and a motion was made and carried that a committee of three be appointed by the chair to draw up suitable resolutions, and arrange for a memorial program of the Club, to be given as soon as the arrangements for it can be perfected. The following were appointed as members of the committee: Dr. C. C. Curtis, Dr. John Hendley Barnhart, and Dr. M. A. Howe.

A communication was read from the secretary of the New York Academy of Sciences, calling attention to the fact that, by the death of Professor Underwood, the Club is now without a representative on the Council of the Academy. Mr. Charles F. Cox was nominated to fill this vacancy, and was unanimously elected.

The matter of distribution of pay for clerical assistance for the treasurer came up for discussion, and, by unanimous vote of the Club, the treasurer was authorized to pay fifteen dollars a quarter for such purpose.

A request was presented from Mr. Stewardson Brown for a grant of $200 from the Esther Herrman Research Fund of the New York Academy of Sciences for aid in completing an investigation of the flora of Bermuda and its origin. This request was approved by the unanimous vote of the Club.

The resignation of Miss Mary E. Davidson was read and accepted.

On vote of the Club the secretary cast the vote of the members electing Mr. Klein to membership.

Mr. G. V. Nash exhibited a flowering specimen of the orchid *Masdevallia bella*.

The Rev. Leander T. Chamberlain read an extract copied from the Province Laws of Massachusetts, 1736–1761, p. 153, entitled "An Act to Prevent Damage to English Grain, Arising from Barberry Bushes." All persons in the province having barberry-bushes growing on their land, were ordered to destroy them before a named date. Severe penalties were described for failure to comply with this law. A brief discussion of the subject followed. The act is here printed in full:

An Act to Prevent Damage to English Grain, Arising from Barberry Bushes

Whereas it has been found, by experience, that the blasting of wheat and other English grain, is often occasioned by Barberry Bushes, to the great loss and damage of the inhabitants of this Province,

Be it therefore enacted by the Governour, Council, and House of Representatives,

That whoever, whether community or private person, hath any Barberry Bushes, standing or growing in his or their land within any of the towns in this province, he or they shall cause the same to be extirpated or destroyed on or before the tenth day of June, Anno Domini one thousand seven hundred and sixty.

Be it further enacted,

That if there shall be any Barberry Bushes standing or growing, in any land within this Province, after the said tenth day of June, it shall be lawful, by virtue of this act, for any person whomsoever, to enter the lands wherein such Barberry Bushes are, first giving three months' notice of his intention so to do, to the owner or occupant thereof, and to cut them down, or pull them up by the roots, and then to present a fair account of his labour and charge therein to the owner or occupant of the said land; and if such owner or occupant shall neglect or refuse, by the space of two months next after the presenting said account, to make to such person reasonable payment as aforesaid, then the person who cut down or pulled up such bushes, may bring his action against such owner or occupant, owners or occupants, before any Justice of the Peace, if under forty shillings; or otherwise, before the Inferior Court of Common Pleas in the County where such bushes grew; who, upon proof of the cutting down or pulling up of such bushes, by the person who brings the action, or such as were employed by him, shall and is hereby, respectively, empowered to enter up judgment for him to recover double the value of the reasonable expense and labour in such service, and award execution accordingly.

Be it further enacted,

That if the lands on which such Barberry Bushes grow are common and undivided lands, that then an action may be brought, as aforesaid, against any one of the proprietors, in such manner as the laws of this Province provide in such cases where proprietors may be sued.

Be it further enacted,

That the Surveyors of the Highways, whether publick or private, be and hereby are empowered and required, ex officio, to destroy and extirpate all such Barberry Bushes as are or shall be in the highways in their respective wards or districts; and if any such shall remain after the aforesaid tenth day of June, Anno Domini one

thousand seven hundred and sixty, that then the town or district in which such bushes are, shall pay a fine of two shillings for every bush standing or growing in such highway, to be recovered by Bill, Plaint, Information, or the Presentment of a Grand Jury, and to be paid, one half to the informer, and the other half to the Treasurer of the County in which such bushes grew, for the use of the County.

Be it further enacted,

That if any Barberry Bushes stand or grow in any stone wall, or other fence, either fronting the highway, or dividing between one propriety and another, that then an action may be brought, as aforesaid, against the owner of said fence, or the person occupying the land to which such fence belongs; and if the fence in which such bushes grow is a divisional fence between the lands of one person or community and another, and such fence hath not been divided, by which means the particular share of each person or community is not known, then an action may be brought, as aforesaid, against either of the owners or occupants of said land

Be it further enacted,

That where the occupant of any land shall eradicate and destroy any Barberry Bushes growing therein, or in any of the fences belonging to the same (which such occupant is hereby authorized to do, and every action to be brought against him for so doing shall be utterly barred), or shall be obliged, pursuant to this act, to pay for pulling them up or cutting them down, that then the owner or proprietor of such land shall pay the said occupant the full value of his labour and cost in destroying them himself, or what he is obliged to pay to others as aforesaid; and if the said owner or owners shall refuse so to do, then it shall be lawful for said occupant or occupants to withold so much of the rents or income of said land as shall be sufficient to pay or reimburse his cost and charge arising as aforesaid.

This act to continue and be in force until the tenth day of June, one thousand seven hundred and sixty-four.

[An Early Massachusetts Statute for the Prevention of Wheat-Rust. *Anno Regni Regis Georgii II, Vicesimo Octavo,* Chap. X. (published January 13, 1755).]

Dr. Britton exhibited a specimen from Jamaica, W. I., illustrating an economic use of cat-tails. This was a "bed," made from the split stems of *Typha domingensis.*

The following scientific program was presented:

"A new *Utricularia* from Long Island," by John Hendley Barnhart.

The new species was described and specimens of it exhibited. The paper and description will be published in full in the *Bulletin* of the Torrey Botanical Club, for December, 1907.

"Some anomalous Leaf-Forms," by C. Stuart Gager.

Specimens were shown illustrating the formation of ascidia in the white (?) clover and in a leaflet of the licorice (*Glycyrrhiza*); variations in the branching of the leaf-blade of a species of *Fraxinus;* transitions in *Aralia racemosa*, from a once-compound to a

normally twice-compound leaf; branching of the leaflets of *Hicoria ovata* and of *Aesculus Hippocastanum*; and various stages of transition, in *Gleditsia triacanthos*, from once-compound leaves to twice- and thrice-compound ones, the transitional forms occurring in some instances on the same branch, and even on the same leaf. Rosette leaves were also shown from several species of Biotian asters, showing gradual transitions from a slight indentation of the margin of the blade along its basal half to the development of petiolate leaflets, so that the leaf appeared to be a pinnately compound one. The possible causes of these variations were briefly discussed.

Brief discussion followed the presentation of both papers.

The Club adjourned at 5:30 o'clock.

C. Stuart Gager,
Secretary.

NEWS ITEMS

Dr. B. M. Duggar has resigned the professorship of botany in the University of Missouri to accept a professorship in Cornell University.

Mr. R. S. Williams, assistant curator of the New York Botanical Garden, left New York for Colon on January 25, expecting to devote several months to making botanical collections in the Republic of Panama.

Mr. George E. Davenport, well known as a student of the North American ferns, died in Medford, Massachusetts, November 29, 1907. He had completed his seventy-fourth year on August 3, preceding.

Mr. Harlan H. York is in charge of the botanical work at the University of Texas, pending the appointment of a professor of botany to succeed Dr. William L. Bray, now of Syracuse University.

Dr. Burton E. Livingston, of the department of botanical research of the Carnegie Institution, has been granted a year's leave of absence, which he will devote to study in European laboratories. He sailed from Boston for Naples on January 11.

Dr. C. B. Robinson, whose appointment as economic botanist of the Bureau of Science of the Government of the Philippine Islands was noted in TORREYA for October, left New York January 21 on his westward journey to the Orient. He plans to sail from San Francisco January 30 on the *Mongolia* for Yokohama and Hong Kong.

Dr. Marshall A. Howe and Mr. Percy Wilson, of the staff of the New York Botanical Garden, returned on January 5 from a collecting cruise of about six weeks duration among the eastern and southeastern islands of the Bahamian group. Visits were made to Watling Island, Atwood (Samana) Cay, Mariguana, the Caicos Islands, Little Inagua, and Great Ragged Island.

The American Association for the Advancement of Science held its fifty-eighth meeting at the University of Chicago, December 30, 1907, to January 4, 1908. The sessions of Section G (botany) were presided over by Professor Charles E. Bessey. The subject of the address of the retiring chairman, Dr. D. T. MacDougal, before Section G, was "Heredity and Environic Forces." Professor Herbert M. Richards was elected chairman of the Section (and vice-president of the Association) for the next meeting, and Dr. Henry C. Cowles was elected secretary of the Section for a term of five years.

The fourteenth annual meeting of the Botanical Society of America was held at the University of Chicago, December 31, 1907, to January 3, 1908, under the presidency of Professor George F. Atkinson. The program included an interesting symposium on "Aspects of the Species Question," the taxonomic aspect being discussed by C. E. Bessey and N. L. Britton, the physiologic by J. C. Arthur and D. T. MacDougal, and the ecologic by F. E. Clements and H. C. Cowles. In addition, twenty-six papers, giving the results of a wide range of botanical research were presented. The retiring president, Professor F. S. Earle was absent, and his announced address on "Botanical Problems and Opportunities" was not read. Officers were elected as follows: Professor William F. Ganong, president; Mr. C. L. Shear, vice-president; Professor D. S. Johnson, secretary; Dr. Arthur Hollick, treasurer.

TORREYA

February, 1908

Vol. 8. No. 2.

SOME EFFECTS OF FROST IN THE SOUTHWEST

By J. C. Blumer

To what extent a severe spring frost in the southwest may injure forest growth is shown by a series of interesting observations by Mr. Frank J. Phillips.* The fact that a large number of tree species in the Chiricahua Mountains of Arizona failed to bear fruit in the autumn of 1907, may have been due to the same cold wave that defoliated the young trees in certain parts of the New Mexican mountains. In 1906 many of these species fruited abundantly notwithstanding the fact that this was a drier season than 1907. It is possible that the general backwardness of the latter season also may have had something to do with it. The pines, however, are known to be intermittent in their seed-bearing habits. The following is a list of Chiricahua species with the seed crops of 1906 and 1907 compared. In many cases the same individuals were observed both years:

	1906	1907
Walnut (*Juglans rupestris*)	An abundant crop of nuts	Not a single nut found
Sycamore (*Platanus Wrightii*)	Balls plentiful	No balls apparent
Cherry (*Prunus salicifolia*)	A good crop of wild cherries	Not a single cherry seen
Box elder (*Acer Negundo*)	A limited crop of samaras	No samaras found
Ash (*Fraxinus* sp.)	Trees loaded with fruit	Crop small or absent
Cascara (*Rhamnus* sp.)	Fruiting abundantly	No fruit observed
Grape (*Vitis* sp.)	A large crop	A small crop
Oaks, seven species observed	Acorns common to abundant	Acorns absent or few †
Arizona pine (*Pinus arizonica*)	Good crop, many trees loaded with cones	Crop very poor, one might travel half a day to find one cone

* Forestry and Irrigation, September, 1907.

† One or two species, however, ranging below 5,000 feet altitude, bore an abundant crop. With exception of these and the ash, none of the species named descends to this level within the region observed.

[No. 2, Vol. 8, of Torreya, comprising pages 1–24, was issued January 27, 1908.]

Mexican white pine (*P. strobiformis*)	Many trees conspicuously filled	No cones apparent
Douglas fir (*Pseudotsuga taxifolia*)	Cones very abundant	Cones scarce
White fir (*Abies concolor*)	No cones found in either year	

In the fall of 1906, the first two severe frosts occurred in the aforesaid mountains on the nights of October 22 and 23. Practically all the herbaceous plants were killed to the ground. A few days later the deciduous tree species along Riggs Creek were examined. *Juglans rupestris*, *Fraxinus*, and *Vitis* had all their leaves killed, proving to be the ones most easily injured. *Schmaltzia* was almost killed in this open canyon, yet in the narrow Bonita Canyon near by, which has high, perpendicular walls, this genus was collected a week later, remarkably preserved. Certain acacias behaved likewise. Sycamore did not suffer greatly, but the least harm came to the willow and the cherry. The leaves of the latter hang on the tree till very late in autumn, hardly losing their green color before they fall. Of all the deciduous arboreal species of this region, this approaches most nearly the evergreen habit. Thus it is possibly relatively frost-hardy for the same reasons as the very frost-resistant as well as drouth-defiant evergreens, such as the oaks. On the whole it appeared that the species which lived upon the least moisture were also the most frost-hardy.

On the other hand, as is well known, the presence of an abundance of water has often a powerfully protective effect. The snowberry (*Symphoricarpus*), growing at an altitude of 8,000 feet, had its leaves nearly killed where growing in the open, severely bitten where standing under trees, damaged but little where growing without a canopy but on springy soil, and escaped without any harm whatever where it stood under the spreading boughs of the white fir while the water trickled about its roots.

Other shrubby genera occurring in this place are *Opulaster*, *Holodiscus*, *Rubus*, *Salix*, and *Ptelea*, but *Symphoricarpus* appears to be the hardiest of all.

Desert Botanical Laboratory,
Tucson, Arizona.

THE WHITE CEDAR IN WESTERN LONG ISLAND

By Eugene P. Bicknell

The article by Dr. R. M. Harper in Torreya (**7**: 198–200. O 1907), entitled "A Long Island Cedar Swamp," makes appropriate some further reference to the southern white cedar, *Chamaecyparis thyoides* (L.) B. S. P., in western Long Island.

In this region the white cedar is one of the rarer trees and is known to me from only three localities, all on the south side of the island. It occurs near Merrick, in Rockville Center, at a point nearly six miles to the west, and again directly west, eight and a half miles between Jamaica South and Aqueduct, this station being within the corporate limits of Greater New York and not ten miles from the Brooklyn Borough Hall.

The locality near Merrick is the cedar swamp described by Dr. Harper and earlier mentioned by Mr. J. T. Nichols in *Rhodora* (**9**: 74. Ap 1907). In the interest of a clear record it should be said that this cedar swamp is the same one to which an excursion of the Torrey Club was conducted by Miss F. A. Mulford on May 30, 1906. Upon that occasion the swamp was explored at a point over half a mile north of the railroad. Dr. Harper traced the cedars several hundred yards south of the railroad. Hence it appears that the growth extends nearly a mile north and south along the stream. Probably no more extensive growth of this tree occurs within a much greater distance from New York.

A colony some eight miles further to the east, just west of Amityville, is also reported by Mr. Nichols (*loc. cit.*).

At Rockville Center two good-sized trees grow near together in the swampy thicket along the brook flowing from Hempstead Pond.

The westernmost station, a mile and a quarter east of Aqueduct, is a swampy spot in the woods which, though it now becomes dry in summer, was once evidently a more permanent swamp and formed the source of a small brook. Here is an assemblage of white cedars not more than a few rods in extent, the remnant of an ancient colony as attested by the size of some of the trees. When last visited, May 9, 1906, many of the trees were dead or

dying, the most vital appearing green in their upper parts only. The largest trunk measured 7 feet 6 inches in circumference close to the base and 6 feet 9 inches a foot above the ground.

Of the localities mentioned by Torrey (1842) that at Hempstead is probably now reduced to the two companion trees at Rockville Center on the stream flowing south from Hempstead, which was dammed and excavated over thirty years ago, I am told, to form the Hempstead reservoir and associated ponds.

Wherever Torrey's Rockaway station may have been, there can be little doubt that it no longer exists.

NEW YORK, December, 1907.

A KEY TO THE WHITE AND BRIGHT-COLORED SESSILE POLYPOREAE OF TEMPERATE NORTH AMERICA. — II

BY WILLIAM A. MURRILL

G. THE SPECIES OF TYROMYCES

1.	Pileus large, 8 cm. or more in diameter.	2
	Pileus small, 5 cm. or less in diameter.	6
2.	Tubes less than 5 mm. long.	3
	Tubes more than 5 mm. long.	5
3.	Surface of pileus marked with circular depressed spots.	*T. guttulatus* (Peck) Murrill
	Surface of pileus not guttulate.	4
4.	Pileus over 1 cm. thick.	*T. palustris* (B. & C.) Murrill
	Pileus less than 5 mm. thick.	*T. obductus* (Berk.) Murrill
5.	Pileus very smooth, becoming dark sordid-bay on drying.	*T. Smallii* Murrill
	Pileus rough, sodden, white, becoming blackish, especially at the margin.	*T. Spraguei* (B. & C.) Murrill
	Pileus tuberculose, ochraceous, not becoming blackish.	*T. tiliophila* Murrill
6.	Pileus resinous or cartilaginous in appearance.	7
	Pileus neither resinous nor cartilaginous.	8
7.	Tubes sharply and deeply lacerate.	*T. cerifluus* (B. & C.) Murrill
	Tubes slightly dentate.	*T. semisupinus* (B. & C.) Murrill
8.	Tubes large, irregular, lacerate, 1–2 to a mm.	*T. undosus* (Peck) Murrill
	Tubes much smaller, usually regular and entire.	9
9.	Surface zonate.	10
	Surface azonate.	11
10.	Pileus 1–3 mm. thick, not effused.	*T. crispellus* (Peck) Murrill
	Pileus 5 mm. or more thick, effused-reflexed	*T. Ellisianus* Murrill
11.	Surface conspicuously villose or tomentose.	12
	Surface glabrous or nearly so.	13

12. Pileus more or less bluish, not effused. *T. caesius* (Schrad.) Murrill
Pileus not bluish, effused-reflexed. *T. semipileatus* (Peck) Murrill
13. Surface pelliculose, more or less tinged with gray. *T. chioneus* (Fr.) Karst.
Surface white, without a pellicle. 14
14. Pileus about 2 mm. thick. *T. Bartholomaei* (Peck) Murrill
Pileus much thicker. 15
15. Edges of tubes obtuse, entire. *T. anceps* (Peck) Murrill
Edges of tubes very thin, lacerate. *T. lacteus* (Fr.) Murrill

H. The Species of Trametes

1. Context punky, soft. 2
Context corky, rather firm. *T. subnivosa* Murrill
2. Tubes small, 4 to a mm.; found on *Robinia*. *T. robiniophila* Murrill
Tubes large, 2 to a mm.; found on *Salix*. *T. suaveolens* (L.) Fr.

I. The Species of Rigidoporus

Pileus thin, rigid, multizonate, reddish; tubes rather slender, edges thin. *T. surinamensis* (Miq.) Murrill

J. The Species of Poronidulus

Pileus thin, conchate, white, with pale-reddish zones; found on elm branches. *T. conchifer* (Schw.) Murrill

New York Botanical Garden.

SHORTER NOTES

The Name Chara. — The origin of the modern application of the name *Chara* has been much disputed, and it may not be superfluous to call attention to one opinion, which seems to be the most plausible, and to connect with it the name of the author who appears to have introduced the word into literature, although he attained his eminence in other fields. Julius Caesar in the 48th chapter of the 3d book of his "De Bello Civile" says: Est etiam genus radicis inventum ab iis, qui fuerant in vallibus, quod appellatur *Chara*, quod admixtum lacte multum inopiam levabat. Id ad similitudinem panis efficiebant.

This may be roughly translated: There is also a kind of root, found by those who had been in the valleys, which is called *Chara*, and this when mixed with milk greatly lessened the feeling of hunger. They make it into the likeness of bread.

No person can possibly advance the idea that the *Chara* of modern botany could be made into bread, with or without the use of milk. This merely proves that the name was in use in

Italy nearly 2,000 years ago; and other evidence seems to connect it with some umbelliferous plant, similar to *Carum Carui*, the caraway, a name probably derived from the same source. The rough resemblance of a *Chara* and an umbellifer is very considerable, and the history of the word would seem to be that it arose as a local name for an Italian flowering plant, was in use in this sense for many centuries, and passed into its present acceptance at the moment when it acquired botanical significance.

C. B. ROBINSON.

NEW YORK BOTANICAL GARDEN.

A RED-FRUITED HUCKLEBERRY.—When visiting the botanically well-known Bergen Swamp in Genesee County, N. Y., in August, 1907, examples of *Gaylussacia resinosa* (Ait.) T. & G. with red or wine-colored fruit were found. The berries were more juicy than in the common form, about like those of *Vaccinium vacillans* as compared in this quality with the average fruit of *G. resinosa.* The usual form with black fruit, as well as *G. dumosa* (Andr.) T. & G., was also well represented there. The oval or oblong leaves of these red-fruited shrubs were somewhat smaller than is commonly the case, 2–3 cm. × 1–1.5 cm., frequently considerably tinged with red, and more inclined to an acute or acutish apex. The leaves of the black-fruited form from the locality were quite obtuse. The shrubs were in those parts of the swamp called "open," in which there are clumps or small areas of bushes of various kinds, often with one or more trees of stunted white pine or white cedar growing with them. Here the ground flora was of sphagna and other peat-loving mosses and of such herbaceous plants as frequent habitats of this character. The larger part of the open swamp has a marly soil, loosely covered with grasses and sedges, and usually with a thin sheet of water above the marl even in the dry season. The water is clear, and in places had a slow movement in the direction of its outlet to Black Creek. The spots occupied by bushes were raised a little above the general level, being gradually converted into highmoor. In such an environment was a clump, 2 or 3 meters across, of this red-fruited huckleberry, well exposed to the full light and heat of the sun.

White-fruited forms of *G. resinosa* are mentioned in our manuals of botany, and the red may also have been detected before. They are analogous to cases more often occurring in the common blueberries. I have several times come upon *Vaccinium vacillans*, with white or pinkish fruit, in the dune region of northern Indiana. Sometimes the bushes will almost or quite exclusively occupy an area of one or two square rods, producing berries of these abnormal colors which can be gathered by the quart.

E. J. HILL.

CHICAGO, ILL.

REVIEWS

Curtis's Nature and Development of Plants*

In this work the author has "had in mind a purpose to make familiar our common plants," this knowledge being considered fundamental in any botanical work. The volume is not offered as a text, but as a reader to accompany lectures and laboratory work. Pedagogically the object is to "quicken the reasoning faculty, and create a desire for a further examination of the subject."

The Introduction discusses, (1) The Nature of the Plant (as made up of cells); (2) The Nature of the Living Substance of the Plant. The four sections of Part I, Nature of Plants, treat, in order, of the leaf, the root, the stem, and the flower, fruit, and seedling. Part II, The Development of Plants, comprises six sections, dealing with, Classification of Plants, Thallophyta, Bryophyta, Pteridophyta, Spermatophyta, Angiospermae (Spermatophyta concluded). Two hundred and forty-four pages are devoted to Part II, and ninety-four to Part I.

In conformity with the aim, familiarity with common plants, physiology is given less prominence than structure and classification. There are no illustrations of physiological experiments. On reading through the chapters, one's attention is arrested by the use of pistil and carpel as synonymous (p. 102); of antheridial cell for the more usual term generative cell (p. 108); and

* Curtis, Carlton C. Nature and Development of Plants. Pp. vii + 471. *f. 1–342.* Henry Holt & Co., New York. 1907.

of epicotyl and plumule as synonyms (p. 112), though on page 122 the plumule is described as composed of leaves.

The volume is one of the best-illustrated books that has appeared for some time, and the omission of half-tones from the illustrations has obvious advantages. Some of the figures will undoubtedly become classical, and supplant the well-worn ones "made in Germany."

We believe that the author's plan of introducing the student to botany by a study of spermatophytes, with which he is more or less familiar, has much to commend it, both theoretically and practically, over the plan of beginning with unicellular plants. The book will undoubtedly materially assist the pupil in getting the most out of his lectures and laboratory exercises.

C. Stuart Gager.

PROCEEDINGS OF THE CLUB

December 10, 1907

The regular meeting of the Club was held at the American Museum of Natural History at 8:30 p. m., with President Rusby in the chair; fourteen persons were present. In the absence of the secretary, Mr. Charles L. Pollard was appointed acting secretary.

The chairman stated, on behalf of the committee appointed to arrange a memorial meeting in honor of Professor Underwood, that the committee had the matter in hand and would be prepared to report at an early date.

A letter was read from Mr. C. F. Cox, elected at the last meeting of the Club to serve as its representative on the Council of the New York Academy of Sciences, in which he stated that owing to the fact of his nomination to the presidency of the Academy it would be advisable for the club to elect another representative in his place. Dr. Marshall A. Howe and Mr. Charles L. Pollard were nominated. The chairman stated that Dr. Howe was absent from the country, and that it was consequently uncertain whether he would be prepared to serve. The nomination of Dr. Howe was then withdrawn and Mr. Pollard was unanimously elected as the representative of the Club on the Council of the Academy.

A letter was read from Professor E. O. Hovey, recording secretary of the Academy, asking the attention of the club to a resolution of the Academy in which the affiliated societies are invited to recommend suitable lectures to be given under the auspices of, and at the expense of the Academy. Dr. Southwick moved that President Rusby be invited, on behalf of the Club, to deliver a lecture under the conditions suggested, and that notice of this be sent to the recording secretary of the Academy. The motion was put by the acting secretary and unanimously adopted. In thanking the Club for the honor Dr. Rusby referred to the interest now displayed in the matter of the purity of commercial drugs in connection with the Pure Food Law, and stated that the proposed lecture, if given, would be upon this topic.

The following scientific program was presented:

"Dictionaries and their Relation to Biology," by Charles Louis Pollard.

The speaker referred to the fact that a large part of the increment in our language in recent years has consisted of scientific terms, including new Latin classificatory names, biological descriptive words and phrases, and vernacular names. In spite of this there is a very general lack of interest among working scientists in the average dictionary, and it is not the indispensable reference book that it should be. The reasons for this are to be sought in the attitude of the publishers toward the style of definitions, the effort to avoid undue technicality often resulting in scientific inaccuracy. Obsolete words and meanings are frequently given too great prominence and are not properly differentiated from those in current usage. There is also a tendency to magnify the importance of so-called popular names, many of which are coined by the writers of manuals and are not used elsewhere.

The general discussion which followed brought out the fact that the dictionary, in spite of its defects, contains much information difficult to obtain from other sources, but that it is very generally at variance with usage among botanists in the matter of pronunciation.

"Notes on the Pine-barrens of Long Island," by Roland M. Harper:

The flora of the pine-barrens of Long Island has received little attention from botanists, chiefly because it consists of comparatively few and widely distributed species. A list of 46 Long Island pine-barren plants was published by Dr. Britton in 1880, and copied by at least three subsequent writers, but even yet the aspects of the vegetation have scarcely been described, or any photographs of it published in botanical literature.

The pine-barrens are confined chiefly to the southern half of Suffolk County, and are very well developed in the uninhabited portions of the towns of Babylon and Islip. The area covered by them is very flat, with a soil of coarse sandy loam. The vegetation is of two types, that of the dry pine-barrens and that of the swamps, the former being by far the most extensive. In the dry pine-barrens the trees are nearly all *Pinus rigida*, and there is a dense undergrowth consisting mostly of *Quercus ilicifolia* and *Q. prinoides*, two to six feet tall. The commonest herbs are *Pteridium aquilinum*, *Ionactis*, *Cracca*, *Baptisia*, *Dasystoma*, etc. The effects of fire are everywhere visible.

In the swamps the flora is somewhat richer than in the dry pine-barrens. *Acer rubrum*, *Nyssa*, *Clethra*, *Alnus*, *Myrica*, *Ilex*, *Osmunda*, and *Dulichium* are characteristic. Ericaceae and allied families are well represented.

Nearly all the species in these pine-barrens are quite widely distributed in the glaciated region, or on the coastal plain, or both. Many also occur in the mountains, from New Jersey to Georgia. The vegetation is very similar to that of some parts of the pine-barrens of New Jersey, from all accounts, but the flora is considerably less diversified.

The paper was illustrated by photographs, and will be published in the January (1908) number of *Torreya*.

The club adjourned at 10 o'clock.

Charles Louis Pollard,
Secretary pro tem.

January 14, 1908

The first stated meeting for 1908 was held at the American Museum of Natural History at 8:15 P. M. Vice-President

Edward S. Burgess occupied the chair. The attendance was fourteen.

After the reading and approval of the minutes for December, 1907, the following names were presented for membership:

Professor William L. Bray, Syracuse University, Syracuse, N. Y.

Mr. Frank Dunn Kern, Agric. Exp. Station, Lafayette, Ind.

This being the annual business meeting of the Club, the chairman called for the reports of officers for 1907. Reports of the secretary, treasurer, editor, and corresponding secretary were read, accepted, and placed on file.

The secretary reported that fourteen regular meetings had been held during the year with a total attendance of 306, as against 219 in 1906, and an average attendance of 21.8, as against 16.8 last year. A total of 37 formal papers was presented before the club, distributed according to subject-matter as follows: taxonomy, 5; physiology, 6; morphology, 4; ecology, 7; regional botany, 5; exploration, 2; lantern lectures, 4; miscellaneous, 4. In addition to these were numerous informal notes and exhibitions of specimens.

The editor reported the publication of one number of the Memoirs, of 47 pages, and the issuance of the *Bulletin* and of *Torreya* as usual. The need of an adequate index to the *Bulletin* from volume one to thirty, inclusive, was strongly emphasized.

On behalf of the committee on the local flora, the chairman, Dr. Britton, urged the need of increased activity, and emphasized the desirability of preparing a special work on the flora of New York City and vicinity. At present no such work exists.

Resignations from membership from Mr. Percy L. Ricker and Miss Bina Seymour were read and accepted.

The secretary was instructed to cast the ballot of the Club electing to active membership the persons proposed as above.

Election of officers for the year 1908 resulted in the election of the following ticket:

President: Henry Hurd Rusby.

Vice-Presidents: Edward Sandford Burgess and John Hendley Barnhart.

Secretary: C. Stuart Gager.

Treasurer: William Mansfield.

Editor: Marshall Avery Howe.

Corresponding secretary: On motion the election of a corresponding secretary was indefinitely postponed.

Associate editors: John Hendley Barnhart, Jean Broadhurst, Philip Dowell, Alexander William Evans, Tracy Elliot Hazen, William Alphonso Murrill, Charles Louis Pollard, and Herbert Maule Richards.

The chairman appointed Dr. Small and Dr. Gager as auditing committee.

After an informal discussion of the personnel of the committees to be appointed for the ensuing year, the club, on motion, adjourned at ten o'clock.

C. Stuart Gager,
Secretary.

NEWS ITEMS

Dr. Raymond H. Pond, who sailed for Europe early in November, is studying in the laboratory of Professor Ludwig Jost in Bonn.

Mr. A. P. Morgan, well known as a collector and student of the fungi, died at his home in Preston, Ohio, on October 19, 1907.

Dr. William A. Murrill, for the past two years first assistant of the staff of the New York Botanical Garden, has been advanced to the rank of assistant director of that institution.

Professor Edward S. Burgess, vice-president of the Torrey Botanical Club, has been acting president of the Normal College of the City of New York since the death of Acting-President Gillet.

Dr. Hermann Graf zu Solms-Laubach, editor of the *Botanische Zeitung*, has retired from the professorship of botany at the University of Strassburg. He will be succeeded by Dr. Ludwig Jost of the Royal Agricultural Academy at Bonn.

Dr. W. A. Kellerman, professor of botany in the Ohio State University, is now on his fourth winter expedition to Guatemala,

accompanied by several student assistants. As on previous visits, he will give special attention to collecting parasitic fungi.

Dr. Anstruther A. Lawson, recently of the department of botany of the Leland Stanford Junior University, passed through New York in December on his way to the University of Glasgow, where he has accepted a position as assistant in botany.

"A Synopsis of the North American Godetias" by Professor Willis Linn Jepson and "Compositae of Southern California" by Mr. Harry Monroe Hall are two important papers of taxonomic interest, which appeared in December in the botanical series of the University of California Publications.

Through the generosity of Mr. Andrew Carnegie, the herbarium of the late Dr. Otto Kuntze of San Remo, Italy, has been purchased for the New York Botanical Garden. This herbarium is estimated to contain over 30,000 specimens, including a considerable number of "types" from South America and other parts of the world visited by Dr. Kuntze during his extensive botanical tours.

Dr. and Mrs. N. L. Britton and Dr. Arthur Hollick of the New York Botanical Garden sailed for Kingston, Jamaica, on February 22. They will be joined at Kingston by Mr. William Harris, superintendent of the Public Gardens and Plantations of Jamaica, and will then make collections at the western end of the island, with the aid of a Bahamian schooner which has been chartered for the purpose. It is expected that a stop will be made at Guantanamo, Cuba, on the return voyage.

No. 6 of the Augustana Library Publications is a Linné Memorial, in which the leading paper is an interesting account of "Scandinavians who have Contributed to the Knowledge of the Flora of North America" by Dr. Per Axel Rydberg. Biographical sketches and bibliographies of 104 Scandinavians and Scandinavian-Americans are included. Pehr Kalm, Carl von Linné, Olof Swartz, Martin Vahl, Elias M. Fries, J. G. Agardh, S. O. Lindberg, Th. M. Fries, J. M. C. Lange, Baron H. F. A. Eggers, William Nylander, Nils Gustaf Lagerheim, F. M. Liebman, A. S. Örsted, N. C. Kindberg, Theodor Holm, Aven Nelson, and P. A. Rydberg, are among the better-known names in the distinguished list.

A notable event in the progress of science and of public education in New York is the bequest of $1,000,000 to the American Museum of Natural History by Morris K. Jesup, who was its president from 1882 to his death on January 22, 1908. The provision in his will relating to the museum reads, in part, as follows:

I give and bequeath to the American Museum of Natural History in the City of New York $1,000,000, to constitute a permanent fund, the principal to be invested and kept invested, and the income to be applied and apportioned to the general purposes of the museum, other than alterations, additions, repairs, or erection of buildings, the purchase of land, or the payment of salaries, or for labor or for services of any kind ordinarily considered under the item of maintenance. * * * I believe it [the museum] to be today one of the most effective agencies which exist in the City of New York for furnishing education, innocent amusement, and instruction to its people. It can be immensely increased in its usefulness by increasing its powers.

The following resolution adopted by the American Association for the Advancement of Science at its recent Chicago meeting, on recommendation of Section F (zoölogy) is of interest to the students of plants as well as of animals:

Realizing that the work in the Panama Canal is changing biological conditions in Panama and that the completion of the canal will enable the fresh-water faunae of the two slopes to mingle freely and that many marine animals will succeed in passing the completed canal, the American Association for the Advancement of Science urges upon the President and Congress to make provision for a biological survey of the Panama Canal zone.

Since the conditions will be permanently changed as soon as the canal is completed and the work can not be satisfactorily done after the completion of the canal, there is great urgency that provisions for the work be made at once.

Resolved, That the permanent secretary be instructed to send copies of this resolution to the President, the Vice-President, the Speaker of the House, and the Secretary of the Smithsonian Institution.

Similar resolutions have been adopted by the council of the American Society of Naturalists.

The Boston Society of Natural History announces the following subjects for the Walker Prizes:

For 1908. 1. An experimental study of inheritance in animals or plants. 2. A comparative study of the effects of close-breeding and cross-breeding in animals or plants. 3. A study of animal reactions in relation to habit formation. 4. A physiological study of one (or several) species of plants with respect to leaf variation. 5. Fertilization and related phenomena in a phenogamous plant. 6. What proportion of a plant's seasonal growth is represented in the winter bud? 7. A physiographic study of the forms and processes discoverable along a varied shore line. 8. A problem in structural geology. 9. A study of one or more geological horizons with a view to determining the different conditions obtaining at one time over a large area, as recorded by sediments and fossils.

For 1909. 1. A geographic study of a district of varied features, presented as involving the natural relations of inorganic and organic elements. 2. A petrographic study of a district of crystalline rocks. 3. A paragenetic study of a mineral locality. 4. The conditions controlling sexual reproduction in plants. 5. Studies in the life history of a thallophyte, with special reference to sporogenesis. 6. Contribution to our knowledge of responses in plants. 7. The factors governing orientation in animal responses. 8. The relation between primary and secondary sex characters in animals. 9. The activities of the animal body in relation to internal secretions.

For the best memoir presented a prize of sixty dollars may be awarded; if, however, the memoir be one of marked merit, the amount may be increased to one hundred dollars, at the discretion of the committee. For the next best memoir a prize not exceeding fifty dollars may be awarded. Prizes will not be awarded unless the memoirs presented are of adequate merit. The competition for these prizes is not restricted, but is open to all. Further particulars may be obtained by addressing Glover M. Allen, secretary, Boston Society of Natural History, Boston, Mass.

The thirteenth annual winter meeting of the Vermont Botanical Club was held at the University of Vermont, Burlington, January 17 and 18, 1908. Twenty-two titles appeared on the program and all the sessions were well attended. Among the items of more general interest were the following: Miss Phoebe Towle reported upon observations extending through several

years as to the period elapsing between blossoming and fruiting of various species of mosses. Dr. Tracy E. Hazen noted the occurrence of *Oxalis Brittoniae* in Vermont; G. L. Kirk recorded another station for the rare green dragon (*Arisaema Dracontium*); D. L. Dutton reported the discovery of the rose-root (*Sedum Rhodiola*), thus adding another to the series of arctic plants found in the Green Mountains. N. J. Giddings described a new bacterial disease of melons. In addition to other papers of local concern, two addresses were delivered by visiting scientists. The annual address was by Professor M. L. Fernald of Harvard, who was the guest of the Club and discussed the flora of the Shickshock Mountains and the Gaspé Coast. This was illustrated by lantern slides and specimens and brought out especially the relation of plant distribution to rock formation. Mr. John Ritchie, President of the Federation of New England Natural History Societies, gave an illustrated account of Mount Washington. He invited the Vermont Club to join the other federated societies in a joint field meeting there the first of July next and it was decided so to do. The same officers were reëlected for the ensuing year, viz., president, Ezra Brainerd of Middlebury College; vice-president, C. G. Pringle; secretary, L. R. Jones of the University of Vermont; and treasurer, Mrs. N. F. Flynn of Burlington. Some twenty names were added to the active membership list, which now numbers nearly 200. This is apparently one of the largest organizations of its kind in the country. It publishes an annual *Bulletin* embodying its proceedings and botanical notes of interest to Vermont botanists.

TORREYA

March, 1908

Vol. 8. No. 3.

BOTANY *

By Herbert Maule Richards

What is the content and scope of the science of botany? Popular opinion will answer somewhat easily: Botany consists in the gathering of plants, and the dismembering of them, in connection with the use of a complicated terminology. That is the beginning and end of botany as it is understood by the majority; there is nothing more to be said. In consequence, the employment of the botanist seems so trivial, so very remote from important human interests that no second thought is given to it. The conception formed in ignorance is continued in ignorance. Even the zoölogist is at an advantage, for the public is finally forced to admit that it does not know what he is about, while it understands the botanist very well. He is quite hopeless, for, while flowers may be pretty things to pick, they should not be pulled to pieces, and if he does not happen to be interested in dissecting flowers he is not a botanist but simply a fraud.

Far from being remote, the study of plants comes very close to human interests. One has but to stop to think that plants are the great energy source for man himself and the animals upon which his well-being depends, to recognize that a careful study of their manner of life, the conditions which favor or hinder their growth is of the very first importance. Besides this, human curiosity demands that plants be investigated, if for no other reason than that they must be made to yield answers to the perpetual questions that man is asking regarding the world about him.

Under botany we have to consider all the questions as to the

* A lecture delivered at Columbia University in the Series of Science, Philosophy, and Art, December 4, 1907, copyrighted and published by the Columbia University Press, February, 1908, and here reprinted by permission.

[No. 2, Vol. 8, of Torreya, comprising pages 25-40, was issued February 26, 1908.]

form, the functions, the classification and the distribution of those organisms that are called plants. Along what lines this study is prosecuted, how it is related to other fields of intellectual activity, and some specific instances of its problems and the manner in which they may be solved is what I shall attempt to tell you.

It would be out of place in a talk like this to devote too much time to a consideration of the historical side of the subject, and therefore only a few of the important movements can be pointed out. Any folk which had so far emerged from the stage of savagery as to stop to notice the world about it would perforce pay some attention to plants. A discrimination of the medicinal uses of plants is often noticeable even in primitive peoples, and with such observation goes also the discrimination of difference in form, the prototype of morphological research. I have seen a Malay coolie who could distinguish seven forms of tropical oaks where the botanist recognizes only four, an evidence that sharp observation is not confined to the highly developed races.

In our own civilization, we can trace back the history of botany to Aristotle, who affords us some record of the plant forms known at his time, though the influence which his philosophy wielded, even down to the middle of the last century, was of vastly greater importance than any contribution which he made to botany itself. Theophrastus gave a fuller account of plants, and later came the inquiring and ever curious Pliny. Dioscorides, however, in the first or second century of our era, was one of the first to investigate plants with any attempt at thoroughness even from the standpoint of the knowledge of the time. As is shown especially by Dioscorides' work, the study of plants was largely from their use as drugs, and they were described simply to facilitate their recognition. Any real knowledge of them was naturally meager, and false ideas that clung for a long time, some until comparatively recently, prevented any proper conception of form and function.

As would be expected the contributions become of less and less value as we approach the middle ages, the botanical writings of which time were full of the wildest fantasy and superstition. The efforts of this period need not arrest our attention.

In the sixteenth century in northern Europe, particularly Germany, there was a movement towards the real study of plants from the plants themselves as evidenced by the works of the herbalists, but no attempt at classification was made. Here there was an attempt at the enumeration and illustration of plants from living specimens, and confused and empirical as this work was, it was actuated by an honest endeavor to record, as accurately as possible, actual forms, and not fanciful abstractions which never did and never could have existed. All the descriptions were detached from one another and little or no attempt was made at classification, though by the repeated study of many similar forms the idea of natural relationship began to dawn in a vague way. The actual purpose of all this plant study was the recording of the officinal plants, for special knowledge of plants was still confined to their uses in medicine.

While this movement was advancing in northern Europe, a mainly artificial system of classification was developing in Italy and found its culmination in the work of Caesalpino, who strongly influenced the progress of botany, even after his own time and into the middle of the eighteenth century. Great as was the advance he made, it would have been far greater had it been given him to break away from the scholastic philosophy which hampered him. We find a curious mixture of a modern spirit of inductive natural science and Aristotelian methods of thought. The latter triumphed in the main, and the result was a formal classification built on idealistic abstractions that is wholly fallacious from our standpoint of to-day.

Emerging from such conditions we find Linnaeus — the bicentenary of whose birth was celebrated last year — and though he too was much influenced by the earlier writers, to him belongs the credit of the emphasis on the fact that some natural system of the classification of plants must exist even though he could not determine it. Linnaeus is popularly termed the father of botany and of zoölogy as well, and in many senses there is reason for it. He was a born classifier and brought considerable order out of immense chaos, but still his classification was artificial, and only to a very limited degree recognized the natural relationships

of plant forms. Linnaeus, however, was wise enough to recognize its artificiality.

From Linnaeus the advance was more rapid, and, while most of the study in plants centered on the work of classification, there were unmistakable signs of other interests. The ideas of the classifier were still hampered by the dogma of the constancy of species, which continually clashed with the insistent and undeniable evidences of the genetic relationships of organic forms. Despite the movement in favor of the idea of the development of species from previously existing forms, despite the views advanced by Lamarck and others at about that time, despite, indeed, the more strictly botanical investigations in the morphological field which were brought forward during the first half of the nineteenth century: despite all these things, the botanist was unable to break away from the concept of groups of plants as abstract ideas. It was not until 1859 that the publication of Darwin's "Origin of Species" drove biologists to a different point of view. Then the rational idea of the evolution of organic forms explained in a similar rational fashion the observed genetic relationships of groups of plants. No longer did the classifier hesitatingly admit the possibility of the evolution of species and deny that of genera and higher groups, no longer did he maintain his artificial groups, which had no more relation to each other than successive throws of dice, but he admitted the whole great scheme implied by the evolution of organic forms from preëxisting types.

Naturally, it is difficult to point out at just what time the modern trend of botanical work found its origin, but one can say, in a general way, that it was about the middle of the nineteenth century, although of the two criteria of progress to which I shall refer, one dates about a decade before, the other about a decade after that time. The establishment by the botanist Schleiden in 1838, and by the zoölogist Schwann in 1839, of the real nature of the cell, and the acceptance of what may be termed the cell doctrine, at once made possible the development of the study of form and structure, both as to adult and as to embryonic organs. With improved optical apparatus and with improved technical methods, many able students added a vast number of

demonstrated facts to the general store of knowledge; in fact, for a time the additions to morphological information very much outran the development of the physiological side, though the latter had had a rational beginning at a prior date. The morphological development depended in the first instance upon the understanding that the cell with its living protoplast, and usually with a wall, constituted a not further divisible morphological unit of living organisms; that every cell must have arisen from a preexisting one; and finally, that all but the lower organisms are composed of thousands of these cells differentiated into distinct tissues. One of the most important figures in this advance of botany from Schleiden's time was Naegeli, who brought to bear a powerful intellect on many of the fundamental concepts both of morphology and physiology. Of the many questions dealt with by him, that of the ultimate structure of organized substance was perhaps the most far-reaching; and to-day, despite its limitations, his Micellar Hypothesis is the most stimulating of any of the theories which have been developed regarding this subject.

The other milestone of progress was Darwin's "Origin of Species" already referred to. Entirely aside from the particular question involved in that work, its importance lies in the fact that it fought the battle and won the victory for the inductive method of reasoning as applied to biological science. Previous to the awakening of botany, due to these and related causes, a botanist usually covered the whole field of his science and had the right to consider himself a specialist in all branches of botany. The rapid accumulation of facts soon demanded, however, a segregation of different lines of work. Thus arose the divisions of botanical activity, which, for our purposes, may be classed under three heads. First, the taxonomic, or as more commonly called the systematic side, which has to do with the classification, mainly as established by gross morphology. Second, the morphological field, which concerns itself with the outward and inward form and structure and the development thereof, which may or may not have direct relation with taxonomic work. Third, there is the domain of physiology, which treats of function. As Professor Wilson has pointed out, there are really but two divisions of

biological work, the morphological and the physiological, so that the separation of taxonomy which really belongs in the first division is rather artificial. The separation however is necessary for many reasons, among which are the fact that the temper of mind and the methods of the workers in the two divisions are quite different.

It is perhaps the tendency of the time, at least in many quarters, to underestimate the value of taxonomic research and this is to be regretted since in classification we have the foundations of other branches of work. Entirely aside from the philosophical value of a well ordered classification, it is an absolute necessity for a starting point of morphology and physiology to have the different species of plants recorded in recognizable form, and, in consequence, to have a classification. It would undoubtedly be a great advantage could organisms be classified as are chemical compounds or could they be located as the astronomers locate the stars and in the same definite and precise manner. Such is hardly possible when we reflect that the question of the identity of an organism must, even under favorable conditions, be somewhat a matter of opinion as well as of demonstrated fact. Despite such limitations of taxonomy, in most of the really important questions opinion is fairly universal, so that our classification is not developed simply at the whim of any one investigator. Taxonomy, however, as soon as it is considered an end in itself sinks at once to the level of mere cataloguing or, worse still, loses itself in the mazes of nomenclatorial controversy. It must be considered in its relation to the problems of plant distribution, of the evolution of new forms, of its philosophical intent, if it is to retain its vitality.

I have spoken of artificial classifications in connection with the work of earlier botanists. How then does the natural classification as understood to-day differ? Primarily, it differs in the admission of genetic relationship of forms, a thing not conceived of by older writers. A natural classification implies higher and lower forms, connected by intermediate ones in all stages of differentiation. However, it does not imply that all these forms exist to-day, nor does it imply that they developed in a single

continuous series from the lowest to the highest. We have no particular right to suppose that all plants can be traced back to a single ancestor; indeed, the evidence is against it. There is no reason why several phyla, or lines of ascent, may not have originated, perhaps simultaneously, from the most primitive form of living protoplasm. The story of the lower aquatic forms certainly indicates this possibility. Of these lower phyla some stopped short, some went on, which ones is a matter to be definitely settled. A good instance, though a somewhat special one, to illustrate the fallacy of the assumption of a single line of relationship, is found among the fungi, the chlorophylless lower forms. Many ingenious authors have attempted to unite them in a single continuous series, when every evidence we now have points to their having originated at several places from the green plants. Who, indeed, would care to deny that new phyla might be originating to-day? Any concept of evolution demands such a possibility; organisms are more plastic than the average person conceives, even in this age.

The object of a natural classification is to consider all the many plant forms, to determine by such marks of genetic relationship as we can discover their place in the series, where they have departed from the main stem and in how far they may have had a line of development of their own. Despite what I have said about the lower phyla, it is not improbable that the higher plants can be traced back to some single source, not that it is to be believed for a moment that this ancestor exists to-day. Living ferns or mosses are no more to be considered the direct ancestors of the flowering plants than are monkeys to be considered the direct ancestors of man.

The establishment of our classification to-day might be compared to the putting together of a puzzle map some parts of which are lost; we can determine how many of the parts fit together, and, by analogy, can tell something of the missing ones. The whole method depends on the admission of genetic relationship, a concept that is built up partly by the study of adult structure, partly by the story of the developmental stages, partly, though in botany less than in zoölogy, by the evidence

of paleontology, but more vividly than in any other way by the actual behavior of certain plants in the matter of giving rise to new forms. This last consideration is of such great importance that we shall come back to it later.

One type of morphological investigation has to do with the study of life histories of plants — the whole life story from egg to egg again — and here we find the morphologist in close relation with the systematist, for upon the results of such researches must largely depend the understanding of the relationships of the great groups. The morphologist who devotes his time to the study of life histories is engaged in the work of tracing the race history of plants from the comparison of the individual development of more or less nearly related forms. Thus the homologies which have been traced among the flowering plants and their nearest allies among the ferns and other forms indicate to us the probable race history of these groups. It is true that the beginning of this work dates back some decades, but it is still, to a large extent, an open field, and numerous investigators are actively prosecuting research along these lines. For example, the alternation of a sexual and non-sexual generation of plants which has long been known as characteristic of the life histories of higher forms has recently been established among the lower groups, and thus a much clearer view of the whole series of the plant kingdom is being obtained.

Somewhat separated, and to a large extent needlessly so, is the work of the plant anatomist and histologist. Formerly pursued from the standpoint of the mere topographical relation of the parts, the conception of the plant as an organism with interrelated and interdependent tissues began to fall into abeyance, until a new point of view has within recent times revivified a somewhat barren field. This point of view is the physiological one, the correlation of structure and function. Here the student of gross morphology and the anatomist unite in a physiological interpretation of the form and structure of plant organs, from which has grown the study of experimental morphology. Advance in this direction has been considerable, and we have now a much clearer idea of the nature and development of plant

organs, or at least, we have a much better attitude in the interpretation of the facts that have been established regarding these matters. The danger which lies in this attitude is the well known one of teleological reasoning, and consequently it behooves us to have some caution in accepting, without thorough evidence, the interpretations which may be made of the relation of form and function and of special adaptations for special purposes. As some one has written, "so many things may be true and so few things really are in the matter of use of special organs," that we must demand above all things experimental evidence before we can accept as conclusively proved any statement as to function. It is permissible to say without such proof that such and such an explanation is plausible, but beyond that is uncertain ground and mere assertion shows a temerity at once magnificent and pitiable. On the other hand, it is questionable if the extreme attitude of iconoclasm as to long established interpretations is necessarily a wholly reasonable one. Destructive criticism is not difficult, and unless some new and better interpretation is suggested the advance in a scientific sense is not considerable.

A further development from this physiological attitude is a branch of biological work known as ecology, a study of the relation and adaptation of single plants or whole communities of plants to their environment and to each other. It is the application in a broad and more philosophical way of the methods of the physiological anatomist coupled with those of the taxonomist; but, in addition, the work of the botanist touches the field of the physiographer and geologist. Ecology is the endeavor to uncover the plan of nature as it governs the relations of the different plant forms in a given area, to understand the why and the wherefore of the association of very different forms in one locality. The keynote of the philosophical development of this topic rests on the conception of the constant struggle of individuals or groups of individuals to maintain themselves against other forms, which leads to a balanced relation of the different species in a given flora. Understanding this, we can see why, if this balance is disturbed, the whole fabric of a plant community may be destroyed and a flora swept away. We are also able to

understand how relatively slight climatic changes may alter completely the character of a vegetation in a given region, and thus to comprehend more readily the changes which must have taken place in past ages. It also shows us the effect of present changes, particularly in regard to the destruction by man of the essential elements of natural plant communities, notably one of the most important of these, the forests. Its use lies in these directions and the danger of its misuse lies in the direction of drawing too positive conclusions from data which are insufficient, and of accepting the results obtained as necessarily final, a common error it is true in any line of thought, but one to which the ecologist has especial temptation.

(*To be continued.*)

COLLECTING AND STUDYING BOLETI

By William A. Murrill

The *Boleti* are fleshy, tube-bearing fungi, the tubes separating quite easily from the flesh of the pileus and from each other. They usually occur on the ground in woods, not more than five of our species being found on decaying wood, and one being parasitic on a puff-ball.

The group always attracts attention on account of the brilliant colors and ephemeral character of its species, and is of special interest because of the large number of edible fungi found in it. One section, with red tube-mouths is considered distinctly dangerous, and some species are too bitter to eat; but with caution one might perhaps use for food over ninety per cent. of the *Boleti* he finds.

Boleti may be collected at any time from June to October, especially if there are frequent rains. In this latitude, July and August usually furnish the largest number of species. To make good specimens of *Boleti* for scientific purposes is probably the most difficult task that presents itself to the field mycologist, and one that he often shirks; which accounts for the scarcity of good specimens of these plants in most herbaria. With some care

and attention to details, however, it is possible for almost any one to do creditable work in this group, and greatly to aid the cause of science in the correct description of species and their proper relations to each other.

Notes made from the fresh specimens are exceedingly important in the case of the *Boleti* because the species are often separated by a number of minor characters which are apt to disappear on drying, and, moreover, because the changes on drying are usually very considerable owing to the large percentage of water. The accompanying blank form will be found useful for these notes, together with small outline sketches of a specimen entire and in section to show its general shape and the relation of its principal parts. It is highly desirable to make also a photograph of the plant or a colored drawing, or both, if time permits; if not, color notes from a color chart, with an accompanying sketch, will be found exceedingly helpful. If one's time is very limited, the following characters should be given preference: the color and color changes of all parts, surface characters of pileus and stipe, form of the veil, taste of the flesh, and color of the spores as shown in a spore-print.

Dried specimens are absolutely necessary for scientific study. Drawings and field notes, no matter how artistic and complete, can never take the place of the plants themselves in the herbarium. Various devices have been used for drying fleshy fungi, the principle being to keep the specimens *continuously* in a current of hot air until *thoroughly* dry. A piece of wire netting suspended above a lamp or a stove forms a simple and efficient drying outfit, which may be enlarged as circumstances require. The dried specimens should be kept in tight boxes with camphor or naphthalene to keep out insect pests.

The determination of specimens is easier while they are fresh, but the collector is often compelled to defer the study of his collections until the winter season brings him more leisure. There are certain advantages in this delay, however, because of the array of specimens at hand at the same time for comparison and the combined experience of the entire season in becoming acquainted with variations and distinguishing characters. If one is

NAME ....

Locality, Date

Habitat

Habit

Size

PILEUS ....

Shape

Color

Changes

Surface

Margin

Veil

Annulus

CONTEXT ....

Consistency

Color

Changes

Odor, taste

TUBES ....

Attachment

Color

Changes

Mouths

Form

Spores

Print

STIPE ....

Attachment

Shape

Color

Changes

Surface

Substance

Changes

Remarks ....

near a botanical institution, he can also, perhaps, make use of a named collection and the literature bearing on the group.

The best single publication on the *Boleti* for field work and general use is Peck's "Boleti of the United States" (Bull. N. Y. State Mus. **2**: 73–166, 1889), in which most of our common species are described and classified. Underwood's "Suggestions for the Study of the North American Boletaceae" (Contrib. Dept. Bot. Columbia Univ. No. 176, 1901), is a valuable supplement to Professor Peck's work, giving citations to literature and illustrations, a list of species known to date, and revised keys with species recently described incorporated. There are no descriptions, however, and the work can be used only in a supplementary way. Atkinson's "Studies of American Fungi" includes full descriptions of a limited number of *Boleti* common in the state of New York. McIlvaine's "One Thousand American Fungi" covers the group most fully, eighty pages being devoted to descriptions and illustrations of *Boleti*, mostly upon the authority of Professor Peck. The majority of the illustrations are, unfortunately, poorly executed and often misleading. The beginner is also warned against adopting too readily the author's ideas regarding certain species considered poisonous by most mycologists, as it is possible that the specimens experimented upon were not in all cases accurately determined. This is especially liable to be true in the case of European species said to occur in this country. No attempt is here made to discredit Captain McIlvaine's valuable work, but the suggestion is that the relation between European and American forms has not yet been satisfactorily determined, even by our best mycologists.

A correct and useful system of classification of the one hundred and fifty or more native species of *Boleti* is rather difficult to construct, with our present limited knowledge of many of the species. For the time being, it is probably best to divide the family into groups that are easily distinguishable, even though arbitrary in some cases, and let the collector record the group to which a plant belongs while it is still fresh. This will greatly facilitate the classification of specimens after they are dried, and will often take the place of valuable data omitted by the collector.

The chief characters used in this temporary grouping are the position of the stem, the habitat of the plant, the coherency, size, and arrangement of the tubes, the presence of a veil, viscid dots on tubes and stem, red mouths to the tubes, a lacerated and deeply-grooved stem, adnate or free tubes, a yellow powder covering the entire plant, and flesh-colored or blackish-brown spores.

The spores vary but little, considering the number of species, most of them being fusiform in shape and ochraceous-brown to ferruginous in color. Flesh-colored, pale-yellew, purplish-brown and blackish-brown spores occur, but they are exceptional. A greenish tint is noticed in the fresh spores of many species, but it usually disappears on drying.

Certain other characters, such as reticulations on the stem, viscidity, changes in color of flesh or tubes, and inconspicuous surface coverings, often vary with age, locality or the weather in some species, and may or may not be reliable, but may be conveniently used at times in connection with more important characters to distinguish certain groups.

A key to these provisional groups is given below, each group being designated by a letter. Well-known species have been used in the key as examples of various groups, as a means of ready identification and comparison.

Groups of North American Boleti

Tubes separated from each other; stem lateral; plants found on decaying stumps, trunks or roots. (*Fistulina hepatica.*) **A**

Tubes attached to each other; stem central, rarely eccentric; plants terrestrial, except in very rare instances.

- Tubes arranged in radiating rows. (*Boletinus porosus.*) **B**
- Tubes usually small, not arranged in radiating rows.
  - Pileus conspicuously floccose.
    - Spores blackish-brown. (*Strobilomyces strobilaceus.*) **C**
    - Spores ferruginous. (*Boletus Ananas.*) **D**
  - Pileus glabrous or subtomentose.
    - Stem annulate. (*Boletus luteus.*) **E**
    - Stem exannulate.
      - Stem and tubes glandular-dotted with a gummy secretion that hardens and turns black soon after exudation. (*Boletus granulatus.*) **F**
      - Stem shaggy and lacerate, with deep reticulated furrows; spores olive-brown. (*Boletus Russellii.*) **G**

Stem hollow at maturity; spores pale-yellow, elliptical. (*Boletus castaneus.*) **H**

Stem and pileus covered with a conspicuous sulphur-yellow powder. (*Boletus Ravenelii.*) **I**

Not as above.

Spores flesh-colored; tubes adnate, whitish, tinted by the spores at maturity. (*Boletus felleus.*) **J**

Spores not flesh-colored, usually yellowish-brown.

Tubes with red or reddish brown mouths, yellowish within. (*Boletus purpureus.*) **K**

Tubes not as above.

Tubes free, white, not stuffed when young; stem not reticulated, often scabrous. (*Boletus scaber.*) **L**

Tubes adnate, white or yellow, not stuffed when young.

Stem reticulated. (*Boletus ornatipes.*) **M**

Stem not reticulated. (*Boletus chrysenteron.*) **N**

Not as above. (*Boletus edulis.*) **O**

New York Botanical Garden.

SHORTER NOTES

Jungermannia in New Hampshire. — All four species of the genus *Jungermannia* hitherto reported from New England have been collected by the writer at Waterville, New Hampshire, during 1906 and 1907. This, while a non-calcareous region, is well supplied with all the bryophytes to be expected there.

The commonest is *J. lanceolata* L., reported from all the New England States. By living on rocks or humus, it is independent of the underlying geological formations; but the other three are rock- and talus-growing plants, and avoid limestone at that. As *J. lanceolata* is unmistakable when fertile, it is herewith dismissed.

New Hampshire is the only state from which the subalpine *J. sphaerocarpa* Hook. is reported. It is found at Waterville on wet granite ledges, facing north, at 2,500 feet altitude, and with abundant perianths. It is a delicate plant, of a clear light-green, without much trace of purple; and it grew mixed with *Marsupella emarginata* (Ehrh.) Dum., *Lophozia alpestris* (Schleich.) Evans, etc.

The other two species were on granite rocks in Mad River, at

Tyler's Spring (45°) at 1,500 feet altitude. This large spring cools the whole neighborhood, but whether that has any bearing upon the occurrence of these particular species here is not known to the writer.

Jungermannia pumila With. grew on the large stones in the river just above the water-line, and bore plenty of perianths. It was in neat dark-green tufts, which were very noticeable among the *Scapaniae*, *Grimmiae*, *Rhacomitrium aciculare*, etc., occupying the same rocks. Reported from Vermont, New Hampshire and Connecticut.

Jungermannia cordifolia Hook. was also on the river rocks in front of the spring, just at the water-line, some of it, in fact, being submerged, although the river was low this year. This is the second station for New England, the other being at Rainbow, Conn. (See Evans, Rhodora 6: Jl 1904). These plants were sterile, and small, as they grew on the rocks with only a little sand about their rhizoids, but were otherwise characteristic. They are purplish-black, in contrast to the last-named species, and are most distinct, with their heart-shaped leaves, thin cell-walls without trigones, and flagella. It should be sought in the remaining New England states. The allied *J. riparia* Tayl. is a limestone plant.

Without doubt there are other species of this genus still undetected among the White Mountains, especially in the vicinity of Mt. Carrigain, which is as yet practically unexplored.

ANNIE LORENZ.

HARTFORD, CONNECTICUT.

REVIEWS

Cole's Bermuda in Periodical Literature *

The author of the handsome and scholarly book that has recently appeared under the title of "Bermuda in Periodical Literature" has given especial attention to the botany, zoölogy

* Cole, George Watson. Bermuda in Periodical Literature, with occasional references to other works: A Bibliography. Pp. ix + 275. With portrait of the author and eight facsimiles of title-pages of ancient books on Bermuda. 1907. The Boston Book Company. $3.00.

and geology of the Bermudas, in so far as these sciences have been represented in periodicals and in the transactions of learned societies. Of the 1,382 entries, 45 of botanical interest are found indexed under "Flora," and a considerable number of additional titles occur under "Algae," "Fungi," "Diatomaceae," "Cedar-tree," etc. Nearly all of the articles cited have passed under the eye of Mr. Cole, and notes giving brief summaries of their substance add greatly to the value and interest of the book. Only three hundred and fifty copies of the work were printed, of which two hundred were for the author. "Bermuda in Periodical Literature" will be of much service not only to those interested in Bermuda from the historical and scientific standpoints but also to any prospective visitor who wishes an intelligent outlook upon what has been written of these islands.

MARSHALL A. HOWE.

PROCEEDINGS OF THE CLUB

JANUARY 29, 1908

The meeting for January 29, 1908, was held in the museum building of the New York Botanical Garden at 3:30 P. M. Vice-President Barnhart occupied the chair and there was an attendance of thirty-four.

The secretary presented the report of Mr. Percy Wilson, chairman of the field committee, for 1907. Twenty-five field meetings were reported scheduled through the months of May to October inclusive, though a few of these meetings were not held on account of inclement weather.

Mr. Edwin B. Bartram, Wayne, Pa., was nominated for membership, and resignations from Mr. W. W. Eggleston and Mr. Eugene Smith were read and accepted. On motion, the secretary cast the vote of the Club electing Mr. Edwin B. Bartram to active membership.

A motion was made and passed that the officers of the Club be authorized to incur necessary expenditures pending the adoption of a budget for the current year. On motion the secretary,

treasurer, and editor were elected as a committee on the annual budget for 1908.

Biographical résumés and appreciations of Professor Underwood's life and work were read as follows:

"A Biographical Sketch of Lucien Marcus Underwood," by Carlton C. Curtis.

"Lucien Marcus Underwood: A Memorial Tribute," by Marshall A. Howe.

"The Published Work of Lucien Marcus Underwood," by John Hendley Barnhart.

"Professor Underwood's Relation to the Work of the New York Botanical Garden," by N. L. Britton.

The above papers will be published in full in the January, 1908, number of the "Bulletin of the Torrey Botanical Club."

The following resolutions, presented by a committee of the Club were read and unanimously adopted:

In the death of Lucien Marcus Underwood, American botany has lost one of its foremost representatives, one who was exceptionally free from prejudice and selfishness and who abhorred all superficiality and obsequiousness. The Torrey Botanical Club has lost a faithful officer and a zealous and enthusiastic supporter of all its activities and interests.

We desire to pay tribute to his superior qualifications and attainments as a man of science, and to express our profound sorrow as we attempt to realize that we shall no more feel the warm clasp of his hand, meet the glance of his sympathetic eye, or hear his cheering words of counsel and encouragement.

The Torrey Botanical Club hereby directs that this minute be entered in its proceedings and duly published with them.

Adjournment was at 4:45 o'clock.

C. Stuart Gager,
Secretary.

February 11, 1908.

The meeting was held at the American Museum of Natural History and was called to order by President Rusby at 8:10 P. M. Sixty-five persons were present.

The chairman appointed the following committees of the Club for the current year.

Finance. — Judge Addison Brown, Prof. H. M. Richards.

Admissions. — Dr. J. K. Small, Mr. G. V. Nash, Dr. C. C. Curtis.

Local Flora. — (Phanerogams) Dr. R. M. Harper, Dr. N. L. Britton, Miss Fanny A. Mulford, Mr. Eugene P. Bicknell, Mr. Richard Schneider; (Cryptogams) Mrs. E. G. Britton, Dr. M. A. Howe, Mr. R. S. Williams, Dr. W. A. Murrill, Dr. Philip Dowell.

Program. — Dr. Tracy E. Hazen, Dr. E. B. Southwick, Mr. Charles L. Pollard, Mrs. E. G. Britton, Miss Jean Broadhurst.

Field Meetings. — Mr. Charles L. Pollard, Mr. G. V. Nash, Mr. F. K. Vreeland.

The special committee on the "budget" for 1908 made a report on the estimated income and expenditures of the Club for the current year.

Dr. E. B. Southwick moved the appointment of a special committee to draft resolutions on the death of Morris K. Jesup, late president of the American Museum of Natural History. The chairman appointed as such committee Dr. E. B. Southwick, Dr. John Hendley Barnhart, and Dr. N. L. Britton.

The scientific program of the evening consisted of an illustrated lecture by Dr. A. J. Grout under the title "A Botanist's Vacation in North Carolina." The lecture was of a semi-popular character and the numerous lantern-slides from photographs taken by the speaker illustrated the scenery and fauna as well as the flora of the mountains of western North Carolina. The speaker's abstract follows:

Seven weeks of last summer's vacation were passed in the "Pink Beds" on the estate of Geo. W. Vanderbilt about forty miles west of Asheville and twelve miles from Brevard. Our visit was made possible and profitable through the assistant director of the Biltmore Forest School, Dr. Clifton D. Howe. The "Pink Beds" is a mountain valley over 3,000 feet above sea-level and derives its name from the color given to the whole valley in spring by the innumerable blossoms of *Azalea*, *Rhododendron*, and *Kalmia*. The climate is cool, like that of Vermont and New Hampshire, but the almost daily thunderstorms, often

almost torrential in character, are an inconvenience to the botan ist. The fauna as well as the flora is an interesting mixture ot northern and southern forms. Many of the forms which at first seem identical with northern species on closer examination are found to have good varietal or even specific differences. The chipmunk, for instance, is undoubtedly a chipmunk but so dark in color as to be scarcely recognizable when first seen. .Of our familiar northern flowers, the daisy, evening-primrose, trailing arbutus, Indian pipe, *Clintonia borealis*, two species of *Trillium*, bluets, Indian turnip, and many others are common; of the shrubs, witch-hazel, *Kalmia*, *Rhododendron maximum*, the pink and the white azalea are noticeable; of the trees, the chestnut, several species of oak, hickory, a few sugar maples, a few white and pitch pines, some ash, and the sassafras, all seem to give the country a familiar look. But on the other hand two additional species of *Rhododendron*, the flame-colored *Azalea*, the chinquapin, the great number of tulip-trees and magnolias, the *Nyssa*, *Oxydendron*, Carolina hemlock, and other unfamiliar trees, the open forest filled with innumerable unfamiliar flowers or unfamiliar species of familiar genera, such as *Phlox*, *Lilium*, *Listera*, *Habenaria*, etc., emphasize the difference in one's latitude and keep one's interest awake.

Miss Gertrude S. Burlingham found about the same number of species of *Lactaria* in Vermont and in North Carolina, *i. e.*, 30–35, and about half of this number were common to both.

About 130 species of mosses were collected; of these about 100 are found in Vermont, but many of these 100 differ appreciably from northern forms.

Hookeria Sullivantii, *Entodon Sullivantii*, *Raphidostegium Novae-Cesareae*, *Pylaisia subdenticulata*, *Campylopus introflexus*, *Campylostelium saxicola*, and three species of *Zygodon* were some of the interesting species collected. The moss flora was found to be essentially like that recorded by Mrs. Britton from southwest Virginia, but 15–20 species that she did not find were collected and several common northern forms which she recorded were not met with. The absence of *Polytrichum commune* and *Harpidium* and the abundance of *Entodon*, *Thuidium*, and *Fissidens subbasilaris* were very notable.

The open pasture-like mountain summits, covered with herbs and some low trees, contrasted strongly with the rocky barren ridges of the northern Appalachians, and spruces and firs (*Abies Fraseri*) hardly appear under 5,000 feet altitude.

MARSHALL A. HOWE,
Secretary pro tem.

OF INTEREST TO TEACHERS

HIGH SCHOOL BOTANY. — It has been suggested that a page of special interest to high school teachers be added to TORREYA. Many of the members are teachers, and there is now no recognized botanical journal interested in high school botany. Few teachers are satisfied with the work they are now doing, and the discussion that such a page should provoke would enable us to come nearer the answers to the following questions:

1. Why can so few teachers defend the high school courses they are now giving?

2. Does the present dissatisfaction felt by the teachers indicate that the work is poor?

3. Is the statement that pupils dislike botany (and zoölogy) true? If so, how do you account for it in the case of botany?

4. Why do so few pupils offer botany for college entrance?

5. Should botany be more closely related to the other science subjects, making a continuous four year course in science (as in Latin, English, and Mathematics in our best high schools)?

6. Why does not the study of botany more often create a lasting interest? Would this be secured by more emphasis on morphology (including classification)?

7. Should the physiological work be more or less quantitative? If qualitative only, how can correct ideas as to time, amount, etc., be assured?

Botany, both as a pure science and as a practical science, has never held a higher place. If we, as teachers, cannot successfully deal with it in our high school classes, there must be something fundamentally wrong. What is it? Is the aim unformu-

lated? Are our methods at fault? Is botany placed too early in the high school curriculum? Do the botanists know where the difficulty lies? Can we teachers find out? Send in your criticisms — favorable and unfavorable. Give us any suggestions as to subject-matter and its arrangement, methods, and that *bête noir*, note-books.

The sixth and seventh questions will be discussed in the April number. Other questions will be taken up in the following numbers if sufficient interest is manifested in this new departure of TORREYA.

JEAN BROADHURST.

TEACHERS COLLEGE.

NEWS ITEMS

Dr. Carlton C. Curtis has been promoted from instructor in botany to adjunct professor of botany in Columbia University.

Dr. H. L. Shantz of the University of Missouri has been appointed professor of botany in the State University of Louisiana.

A Transvaal Biological Society has been formed at Pretoria to promote the discussion and investigation of biological problems.

Mr. H. R. Fulton of the Louisiana Experiment Station has accepted a position in the department of botany at the Pennsylvania State College.

Mr. W. W. Eggleston, who is working upon the North American thorns, has been assigned a research scholarship for two months in the New York Botanical Garden.

It is reported that Dr. Forrest Shreve, associate professor of botany in the Woman's College of Baltimore, has accepted an appointment on the staff of the Desert Botanical Laboratory of the Carnegie Institution at Tucson, Arizona.

The January number of the Bulletin of the Torrey Botanical Club was made a memorial of Professor Lucien Marcus Underwood. The longer contributions are by Dr. C. C. Curtis, Dr. M. A. Howe, Dr. J. H. Barnhart and Prof. N. L. Britton.

"The Guide to Nature and to Nature Literature" is the title of a new magazine which is announced to begin publication this

spring. It is to be the official organ of the "Agassiz Association" and will be edited by Edward F. Bigelow, who for many years has had charge of the "Nature and Science" department of "The St. Nicholas Magazine."

Mr. William Kent, of Chicago, Ill., and Kentfield, Cal., has presented a tract of 295 acres of magnificent sequoias in Redwood Canyon, near San Francisco, to the government. The tract lies on the southern slope of Mount Tamalpais, six miles from San Francisco, and is one of the few tracts of redwood forest in its natural state in all California.

The Field Museum of Natural History, Chicago, has received through the University of Chicago, the complete herbarium of that institution, which was inaugurated and augmented by Professor J. M. Coulter during the past twenty-five or more years of his active botanical researches. The herbarium contains about 50,000 sheets, among which are a large number of types, co-types and specially studied species.

At a meeting of the Council of the New York Academy of Sciences held on March 2, the president was authorized to appoint a committee of arrangements for the Academy's celebration of the one hundredth anniversary of the birth of Charles Darwin and the fiftieth anniversary of the publication of his "Origin of Species." This committee has been constituted as follows: Messrs. Hovey (chairman), Beebe, Bristol, Britton, Bumpus, Cattell, Chapman, Crampton, Dean, Howe, Kemp, Osborn, Rusby, Stevenson, Wheeler, and President Cox, *ex officio*.

Austin Craig Apgar, of the N. J. State Normal School, died March 3 of apoplexy. Professor Apgar was born in 1838 and in 1862 was graduated from the N. J. State Normal School, where he afterward taught for more than forty years. He studied in the summer schools of Louis and Alexander Agassiz and was himself widely known as a summer school and institute instructor. His best known books are "Birds of the United States" and "Trees of the Northern United States"; he left unfinished a large and valuable book on American trees. Professor Apgar was one of the earliest advocates of field and laboratory work and never lost the naturalist's enthusiasm.

Press dispatches bring the sad news of the death in Guatemala on March 8 of Professor William A. Kellerman, head of the department of botany of the Ohio State University. In company with several student assistants he was on his fourth winter expedition to Guatemala, as was briefly noted in the February Torreya. Professor Kellerman was born in Ashville, Ohio, May 1, 1850, was graduated from Cornell University in 1874; and received the degree of Ph.D. from the University of Zürich in 1881. He was professor of botany in the Kansas State Agricultural College from 1883 to 1891, since which time he had been professor of botany in the Ohio State University. In 1885, in association with J. B. Ellis and B. M. Everhart, he established *The Journal of Mycology*, which, in 1889, on the completion of the fourth volume, was continued by the U. S. Department of Agriculture as a bulletin of the Section of Vegetable Pathology until 1894, when its publication ceased, only to be resumed in 1902 as an independent organ under the editorship of Professor Kellerman. In addition to numerous papers on the fungi, Professor Kellerman was the author of a text-book under the title of "Elements of Botany," an "Analytical Flora of Kansas" (with Mrs. Kellerman), a "Catalogue of Ohio Plants" (with W. C. Werner), and a large number of short articles involving a wide range of botanical activity. Professor Kellerman was a member of the Torrey Botanical Club.

TORREYA

April, 1908

Vol. 8. No. 4.

BOTANY *

By Herbert Maule Richards

It is in the field of physiology more than anywhere else, perhaps, that the worker must humble himself before the immensity of the problems before him; that he must realize how fragmentary is the most advanced knowledge of this subject. The foundation stone of physiology is chemistry, and consequently its advance must go hand in hand with the advance of that science; but there is also, it must be admitted, the element of empiricism, which is an unfortunate necessity in any branch of learning where any considerable mass of facts are not yet correlated. The greatest advances are made in the direction of resolving this empirical information into more compact and definite form, a task only possible by the accumulation and correlation of great masses of data in connection with the more definite information afforded by chemistry or physics and more particularly modern physical chemistry. It is plain, then, that we can never go ahead of the data afforded by these sciences, but must always follow somewhat behind them. It must not be supposed, however, that physiology is in a nebulous condition, despite the fact that we are but on the margin of the unknown. Distinct and creditable advances have been made since the days when the knowledge of plant morphology and the chemistry of Lavoisier made possible any reasonably satisfactory explanation of the functions of plant organs. The establishment of a proper understanding of how the plant obtains its food has been a matter of the utmost importance, both from the development of theoretical physiology, and from the standpoint of practical use. We

* A lecture delivered at Columbia University in the Series of Science, Philosophy, and Art, December 4, 1907, copyrighted and published by the Columbia University Press, February, 1908, and reprinted by permission in Torreya, beginning with the March number.

[No. 3, Vol. 8, of Torreya, comprising pages 41–64, was issued March 27, 1908.]

know not only the definite chemical elements which are essential for plant life, but we know also the quantity and form in which they are most favorable for plant growth. Having established this, it is possible to understand the rôle of plants in the general economy of the world, and how their manner of life, in a broad sense, supplements that of animals. There is also pretty definite information as to the physical phenomena connected with the absorption of the raw food materials which the plant afterwards elaborates, information which is largely due to the classic researches of Pfeffer, whose work, it may be remarked, also afforded van't Hoff valuable data for his contributions to the establishment of the modern physical chemistry. Application of the laws of diffusion and of osmosis, as shown by Pfeffer, enables us to understand why a plant may absorb more of one mineral salt than of another, though both be presented to it in solutions of equal concentration; why it cannot absorb some substances at all, while on the other hand it cannot avoid absorbing certain substances, even though they be violent poison and kill the protoplasm of the absorbing cell at once. We understand also a good deal of the mechanism of the production from simple inorganic substances of the first organic food by the green plant, the first organic food of the whole organic world. While, as will be shown later, the precise details of this process are not fully understood, the general facts are a matter of almost common information, so well known that I hesitate to speak of it here, though to sum up the matter in a few words it may be said that this process of photosynthetic activity of green plants is carried on by the living cells in the presence of sunlight, through the agency of the green coloring matter — chlorophyll — which is present in the leaves, and that the chemical reaction involved results in the union of the carbon dioxide absorbed from the air, with water absorbed from the soil, to form the first simple carbohydrate that is to be detected in easily recognizable form as starch. The fact that this process takes place does not interfere with the operation of another one, namely, the absorption of oxygen with the giving forth of carbon dioxide, that is concerned in the mechanism of respiration. Respiration as a means of

releasing the stored energy in available form for the constructive work of the organism is as necessary in plants as it is in animals. These four fundamental questions, namely, the inorganic substances required by plants, the manner of their absorption, the manufacture of the first organic food, and the nature of respiration are perhaps the most important physiological facts, in the field of nutrition at least, which have been definitly established, and from any point of view their importance is a far reaching one.

In the other great field of physiological research, the study of the mechanism of growth and change of form, much information, made possible by the proper understanding of the cellular character of all living organisms, has established many facts as to the relation of plants to the great physical forces which govern the conditions, the rate and the direction of their growth. This is the study of the dynamics of plants, of when and how the energy released by the nutritive functions is applied to the upbuilding of new tissue and the movement of plant organs. Besides the questions concerned in the influence of diffusely exerted external factors, there are also the effects produced by these same forces when the stimulus is unequal or one-sided. The latter conditions result in characteristic growth curvatures or tropisms, which continue until the plant organ by its own action is brought once more into a state of equilibrium with the external forces. In short, the various plant organs are attuned to the normal conditions of equilibrium under which they grow, and have the ability to perceive and, to a limited extent, to transmit the impulses resulting from a disturbance of that equilibrium. This brings us to the question of the sense perception of plants, manifested in a somewhat bizarre fashion in the sensitive plant, but we should go very slowly in the direction of interpreting this perception in the same terms that we do that of higher animals. It is not for an instant to be supposed that plants have any nervous system such as is characteristic of the higher animal forms. While plants can and do respond to differences in light intensity less than that which the human eye can perceive, it is gratuitous to suppose that there is anything analogous in the two processes. The possibility of any reasoning action or instinct on the part

of plants is a question that the plant physiologist does not seriously entertain.

In selecting for discussion present-day problems which may be considered fundamental, one is embarrassed by the wealth of material and therefore but one more or less connected series of topics which leads up to the modern mechanistic conception of life processes has been chosen. In doing so it has been necessary to ignore equally important questions which, though developed from no less a mechanistic standpoint, are more scattered.

In referring to the assimilation of carbon dioxide by green plants and the production of organic food thereby, it was necessary to admit that the details of the process are not satisfactorily known. It is evident, however, that the starch, which is the first substance that we readily recognize, is not the first substance which is formed. Modern research points more and more to the conclusion that it is the simplest of carbohydrates that is produced, — a substance known as formaldehyde. But what is especially interesting is that it seems not impossible that this primal reaction may not after all be a function of the living protoplasm, but a chemical reaction that can be carried on outside the cell through the agency of chlorophyll. It is in the further elaboration of this first substance formed that the living protoplasm is apparently necessary. At any rate we know that the energy demanded for the process must be afforded by the particular rays of sunlight which the chlorophyll absorbs.

In this photosynthetic activity of the green plant the carbohydrate supply of the world has been accounted for, but there is an equally important question not concerned in this process, namely, the source of nitrogen. Nitrogen is of course an essential element for the construction of protoplasm. As is well known most plants can utilize it in simple combination with oxygen in the form of a nitrate, a sharp contrast, by the way, to the typical animal which requires it offered as an organic compound. It is also known that the same plants cannot assimilate the free nitrogen of the atmosphere, and further, in the processes of decay, free nitrogen is liberated by the breaking down of the nitrogen compounds in dead organic matter. The logical conclusion of

these momentous facts is that soon all the world's supply of combined nitrogen would be exhausted — neglecting the relatively small replenishment induced by cosmic forces — so that green plants and consequently animals, would not have the wherewithal to live, unless there were some organisms which could avail themselves directly of this inert gas. Now there are plant organisms which have the ability to assimilate the uncombined nitrogen of the air: certain bacterial forms, and it also appears some somewhat higher plants. But the operations that lead to this result are by no means satisfactorily explained, and the whole topic is one of live interest both from a theoretical as well as a practical standpoint. It should be added that from the latter point of view, a process by which a combination of nitrogen with other elements in a form that is acceptable to green plants has been devised, and bids fair to become of great importance, for combined nitrogen is the great need of the organic world.

The processes of nitrification naturally lead us to the question of the elaboration of nitrogen compounds within the cell, of the final construction of proteid material that is the actual food of the protoplasm; but here we are much in the dark, partly because we have so little real information as to the chemical structure of the more complicated nitrogenous substances. The explanations now given as to how this elaboration takes place are largely hypothetical and must be regarded as quite unsatisfactory.

A step further from the proteid food is the question of living protoplasm itself, and one of the most interesting problems connected with this is the nature and functions of the enzymes, — the ferments and digestive secretions of living cells. Many of the newer theories as to the nature of living protoplasm hark back to investigations regarding enzymes, indeed some extremists advance the opinion that the activities of the live protoplast are in themselves but the result of the interaction of substances enzymatic in their nature. There is no doubt of the power of the appropriate enzymes when present even in infinitesimal amount to cause enormous molecular changes in the substances on which they act, but it is necessary to exercise extreme caution before

accepting generalizations along this line, no matter how brilliant. The amount of empirical information in this field is already becoming unwieldy, and nowhere else is the necessity of unifying principles so plainly shown. Here it is that more definite chemical knowledge may in one stroke clear up the whole situation.

If it is not possible to ascertain the chemical structure of a single enzyme, how much more difficult then must it be to determine that of the living protoplasm? It goes without saying, that if we try to analyze the living protoplasm, in the ordinary chemical sense, we kill it. This being the case, the student who is trying to penetrate these difficult problems must have recourse to other modes of attack. Therefore does he experiment with the effect of agents which do not kill but merely stimulate the organism or partially inhibit its functions and, by studying the nature and products of the reactions produced, obtain in an indirect manner clues to the real nature of life processes. The fascination of these plunges into the unknown is perhaps hardly comprehensible to those who are not engaged in the work, but all must admit the importance of the end they have in view, namely to penetrate a little further into the mystery of life. The advance in all these fields is of necessity along the line of the mechanistic conception of vital manifestations, that is, the reference of them to chemical and physical laws. To appeal to a "Vital Force" is, as my predecessors in these lectures have said, to appeal to an empty name, a mere "question-begging epithet." It is obvious that if we are to make any progress at all, we must admit of the possibility of some solution that our senses can perceive, even though we are perfectly willing to admit that the final answer may never be reached. The reference of vital phenonema to a vague "Vital Force" would mean the extinction of inquiry by robbing the investigator of any sense of responsibility for adequate explanations of the results of his researches.

(*To be continued.*)

STUDIES IN THE OPHIOGLOSSACEAE — I

A Descriptive Key to Ophioglossum in the United States

By Ralph Curtiss Benedict

The following synopsis is designed to serve two purposes: to express some of the relationships existing between the various described taxonomic units of the genus, and to further the identification of these units. The terminology used is explained in the following generic description.

Plants small, terrestrial; the rhizomes small, erect, more or less tuberous; the fronds one to four, herbaceous, consisting of a usually short, cylindric commonstalk, bearing at its summit an entire, oblique or horizontal, linear-lanceolate to reniform, sessile or short-stalked lamina, and a single, usually long-stalked spike, the sporophyl.

The terminology in the Ophioglossaceae is in a rather unsatisfactory state. Prantl, who has given the genus *Ophioglossum* a very thorough systematic treatment, used the Latin equivalents for "leaf" and "petiole," and spoke of the sporophyl as "arising from the petiole or base of the lamina." But the lamina and sporophyl seem to be morphologically coördinate, so that this expression is inaccurate. Professor Underwood has used instead of "petiole" the term "common stalk," which, although not altogether satisfying, is at least not misleading, and this expression is adopted here, being used, however, as a single word.

Morphological studies of the group seem to demonstrate that the structure here called a "frond" is undoubtedly foliar in origin. On this account, the "common stalk" might as well be called a common petiole, but here the analogy ceases, for the vegetative and reproductive structures above certainly do not correspond to the blade or lamina in ordinary fern or flowering plants. Perhaps the best way out of the difficulty would be to coin one or more new terms for the anomalous structures in the family, but this can best be left to the morphologists at whose hands the group needs further study.

The genus may be subdivided as follows:

Lamina deltoid-ovate or cordate, base auriculate or truncate; rhizome globose, 5–10 mm. thick; commonstalk short, hypogean; fronds two to four, rarely solitary; spike short and stout. (Southern States, Mexico and South America.)
1. *O. crotalophoroides* Walt.*

Lamina lanceolate or spatulate to ovate, rarely broader, base acute, obtuse or rounded.

Plants normally small, usually less than 9 cm. high (1.5–11.5); fronds two or three, rarely solitary; commonstalk hypogean, usually less than ⅓ the height of the plant.

Rhizome very small, short-cylindric to globose, 2–5 mm. long, 1.8–5 mm. thick, lamina usually plane and horizontal, ⅓–¼ the height of the plant; median vein emitting one or two branches, areolae mostly small and divergent; spores 0.030–0.040 mm. thick. (Southern States and Cuba.)
2. *O. tenerum* Mett.

Rhizome larger, long-cylindric, 2–17 mm. long, 2–3 mm. thick, lamina usually folded and upwardly inclined, ¼–½ the height of the plant; median vein simple except for secondary connecting veinlets, areolae mostly larger and parallel; spores 0.040–0.050 mm. thick. (California and Mexico.) 3. *O. californicum* Prantl.

Plants larger, usually more than 12 cm. high (6–40); fronds usually solitary; commonstalk ½ or more epigean, ⅓–⅘ the height of the plant.

Lamina lanceolate, spatulate, elliptic, oblong or ovate, apex rounded or sometimes acute, not apiculate; spores reticulately marked with thin ridges, more or less verrucose.

Plants usually more than 15 cm. high; lamina variable in shape; commonstalk usually ½ the height of the plant or more, mostly epigean. (Usually in wet boggy ground, Northeastern North America, Europe and Asia; also in Mexico?) 4. *O. vulgatum* L.

Plants mostly less than 15 cm. high; lamina lanceolate or elliptic; commonstalk about ½ the height of the plant, about ½ hypogean. (In sand, New Jersey, New York and New Hampshire.)
5. *O. arenarium* E. G. Britt.

Lamina elliptic or rarely ovate. usually acute, apiculate; spores merely finely pitted, faintly verrucose. (Virginia and Indiana to Mexico.)
6. *O. Engelmanni* Prantl.

Prantl, in his monograph, in which he treats the genus from a world-wide point of view, divides what he considers to be *Euophioglossum* into two groups of species according to the branching or non-branching of the mid-vein of the lamina, one of the characters used here to distinguish *O. tenerum* from *O. californicum.* In a general treatment, it may be necessary to make use of this

* *O. reticulatum* L. of tropical regions in general, is like *O. crotalophoroides* in the shape of the lamina, but differs in its greater size, usually solitary fronds, and in having a long, mostly epigean commonstalk, and a cylindric rhizome.

character, but it is hardly satisfactory even when most distinctive, and is often obscure and hard to ascertain, and, in a consideration of the species of a relatively limited area, its use may well be avoided. In his treatment of the American species, Prantl's work is in some respects deficient, owing to the fact that his material of these plants was for the most part scanty. For example, his description of *O. crotalophoroides*, a species originally from South Carolina, was with two exceptions based on South American collections. Of *O. californicum* he saw only part of one collection, of *O. tenerum*, one specimen, and similarly of others from South America. The result has been that some of his descriptions are rather incomplete, but in view of his insufficient material it is to be wondered that he was able to define the species as accurately as he did, and it is a tribute to his ability that his conception of specific limits has, after study of ample material, been generally affirmed.

New York Botanical Garden.

THE STORY OF THE MANGROVE

By George V. Nash

Those who have been to the southern parts of our own state of Florida, or have visited the shores of tropical America, have perhaps noticed, fringing the shores in many places, a shrub or small tree, from the horizontal branches of which descend long gaunt roots, and bearing, usually in great profusion, long club-shaped pendulous bodies which sway and dangle in every breeze. But have you realized the vast importance of this plant and the tremendous work it is accomplishing, and have you really understood what those peculiar long bodies are and what an important part they play in the dispersal of this plant, and hence in the increase of tillable land in the tropics, for this unassuming plant is a great land builder — how I will attempt to show later.

To fully understand what the plant is doing, we must first understand the plant itself. A native of the lowlands of its home, where it is always warm, this plant seems to have no seasonal

activity, but to be always growing, so that flowers and fruit may be found upon it at almost any time. If you will examine the flowers you will find that they have four sepals and petals, and present an appearance not unlike many other flowers with which you are acquainted. But look further, and you will find hanging to the tree numbers of club-shaped bodies six to eight inches long, or even longer, in the manner shown in the fourth illustration of this article, where in the higher branches these may be

FIG. 1. Showing hypocotyls and mangroves in various stages of development.

clearly seen. It is these odd bodies which are peculiar to the mangrove, and which lend to it its great interest, but what are they? They are really young plants, for the seeds of the mangrove germinate while still in the ovary, the developing embryo finally bursting through the apex of the ovary and producing these long club-shaped bodies, known to botanists as hypocotyls. It is not the hypocotyl which is peculiar to the mangrove, for this is found in all young plants, but it is the great and unusual

development of this organ, while still attached to the tree, which is peculiar. At the small end of these peculiar bodies is the plumule, where are concealed the first leaves of the plant, while the other end of the hypocotyl is much enlarged.

Now what happens when the young plant has reached that stage in its development when it separates from the parent tree? The mangrove, as has been said, grows along the shore, and the pendant hypocotyl, when it breaks from the tree, falls, as would

FIG. 2. A well developed colony extending itself into the water.

a plummet, the big end down. If the water under the tree be shallow, and even eighteen inches would not thwart its object, these bodies penetrate the mud in an upright position and soon take root, sending forth their leaves and in a short time developing into vigorous plants. If, on the contrary, the water be too deep, they rise to the surface after their plunge and float about, for they are lighter than the water, at the capricious whim of tides and winds. In time some of them find a resting place on

a congenial shore, perhaps after tortuous and devious journeyings, and form the basis of a new colony. This is well shown in the first illustration, where a number of these plants may be seen in the hypocotyl stage. To the left is a young one firmly attached to the soil and beginning to grow, while in other parts of the picture will be found other plants in various stages of development. This colony increases until a condition represented in the second picture is reached. Here we see the network of roots,

FIG. 3. Interior of a mangrove swamp, showing interlacing roots.

to which reference will again be made, and also the long gaunt roots descending from the spreading branches. It is these descending roots which extend the zone of the mangrove further and further into the water. Imagine this process to have continued for a number of years, then let us enter one of these mangrove swamps, and we would see before us a vast tangle of arching and interlacing roots, as represented in the third illustration, the surface of this entangled mass being two to three or

four feet above the slimy ooze below. And what purpose does this vast sieve-like mass effect? As the tide rushes in it bears with it masses of decaying vegetable matter and detritus of various kinds, which, when the tide runs out, is in large part left behind. These, added to the decaying leaves which are constantly dropping from the trees above, at length build up a slimy bottom, which, eventually rising above the water, in time becomes solid ground and fit for agricultural purposes. The continuation of

FIG. 4. Rear of a mangrove swamp, showing its recession from the dry land.

this process at last leads to the undoing of the mangrove itself, for, being a lover of the water or of wet places, it finds the new conditions uncongenial and begins to recede, thus vacating the land which it has itself built up, and adding largely, year after year, to the soil available for the purposes of man. In the fourth illustration this stage of the development is depicted. Here may be plainly seen the receding mangrove and the intervening strip of barren land between it and the distant hillside, where the

colony first found a congenial foothold, and from which it has been forced by conditions of its own creating. This barren strip will soon be utilized by man for the growing of crops, and, indeed, the process has already begun, for at the very base of the hill may be seen a small plantation of bananas.

The illustrations accompanying this article were made from photographs taken by the writer on his last journey to Haïti in 1905, and were secured about eighteen miles to the westward of Cap Haïtien.

Here then we have the story of the mangrove. One hardly realizes as he stands looking at the fringe of one of these swamps that a great work is being slowly but irresistibly carried on year after year. Nor does he fully comprehend how well adapted this plant is to its work, until he studies carefully the structure of its fruit, and its method of forcing itself into the domain of the waters, thus transforming them to the uses of mankind. This work is going on in many parts of tropical America through the agency of the plant known to botanists as *Rhizophora Mangle*, a name given to it by Linnaeus in 1753. In other parts of the world are other species of the same genus carrying on the identical work, so perhaps the magnitude of the result may be realized. Not only is the mainland extended by this plant, but islands are formed by it. Some of the floating hypocotyls become stranded on reefs or in other shallow places. At first we have perhaps but a single plant, such an one as is represented to the left of the first illustration. This in time forms its network of roots, catching and retaining detritus, and finally is formed a small island, which continues to grow as long as the mangrove can find congenial surroundings. In the shallow waters surrounding the keys of south Florida many islands have been built up in this way, and these in all stages of development may be seen there now.

There are other land-builders in the tropics, such as the minute coral animals, but perhaps none can excel the mangrove in this work, and certainly in none is the process more apparent.

REVIEWS

Sturgis's The Myxomycetes and Fungi of Colorado*

This paper is No. 1 of a series by Ellsworth Bethel and William C. Sturgis, entitled "The Myxomycetes and Fungi of Colorado." In the series it is intended to cover the mycological flora of Colorado, including the Rocky Mountain region, which hitherto has been largely neglected by mycologists. In the present paper nearly one hundred species and varieties of Myxomycetes are described. Preceding the descriptions are brief notes on life history, collecting and preservation, microscopic examination, and literature. It is intended that the paper may serve as a beginner's guide, and the key is based upon the synopsis of the orders and genera in Lister's *Monograph of the Mycetozoa.*

C. STUART GAGER.

Hanausek's Microscopy of Technical Products†

This work is the result of the many years of labor of the distinguished expert, investigator and teacher, Dr. Hanausek, analyst of the Governmental Food Laboratory at Vienna. After a brief introduction on the use of the microscope and microchemical reagents, the authors discuss in nine chapters the following commercial products: (1) starch and inulin; (2) vegetable fibers, under which heading attention is also given to the examination of paper; (3) animal and mineral fibers and textile fabrics; (4) stems and roots; (5) leaves; (6) flowers; (7) fruits and seeds; (8) teeth, bone and horn; (9) microchemical analysis for various acids and minerals.

The book is designed as a guide to the student entering the field of technical microscopy and aims to familiarize him with the methods of investigation and to prepare him for independent work. It teaches the technical worker how to investigate microscopically commercial raw materials with reference to their com-

* Sturgis, William C. The Myxomycetes of Colorado. Colorado Coll. Publications. Gen. Ser. No. 30. Sci. Ser. **12**: 1–43. Colorado Springs, Colo., 1907.

† Hanausek, T. F. The Microscopy of Technical Products. Revised and translated by Andrew L. Winton, with the collaboration of Kate G. Barber. Pp. xii + 471. *f. 1–276.* John Wiley and Sons, New York, 1907. $5.00.

position and suitability for technical purposes, thus enabling him to reach practical conclusions. The origin, harvesting, preparation and utilization of material are also briefly considered whenever the methods of preparation have an influence on the structure of the raw material.

The English edition has been improved by the introduction of over forty new cuts. The drawings by Winton and Barber are a decided improvement over many in the original work which are occasionally so diagrammatic as to be almost misleading. Note should also be made of the very considerable additions to the chapter on textile fibers and of the discussion of commercial timbers which has been revised and extended so as to include the most important North American species.

Noteworthy features of the book are the citations of the literature dealing with the various topics treated and the attention that is given to the solution of purely practical problems. Mention should also be made of the discussions of the more important morphological and biological features of the various organs and structures studied so that the student begins his examination of the commercial products with an understanding of the nature and origin of the various cells and tissues with which he is dealing. While in some minor respects this treatment is not in accord with present day botanical teaching, it will be conceded that the presentation has been made with a clearness and conciseness of statement and with a simplicity and consistency of terminology that may well serve as models for future authors.

Considering the range of the work, the authors have been remarkably successful in handling the various topics and have furnished to technical microscopists a timely and valuable textbook.

Carlton C. Curtis.

PROCEEDINGS OF THE CLUB

February 26, 1908

The Club was called to order at the Museum of the New York Botanical Garden at 3:45 p. m. Ten persons were present.

After the reading and approval of the minutes of the preceding

meeting, resignations were read and accepted from Mr. W. H. Liebelsperger, Mr. J. Charles Roper, Mr. James Walker, Mr. George Wirsing, and Dr. H. E. Hasse. These resignations were accepted by the Club.

The scientific program consisted of two papers, of which the authors have submitted the following abstracts:

Remarks on the Genus Boletus. By Dr. William A. Murrill. This paper will be published in the March (1908) number of TORREYA.

Some Fern Hybrids. By Mr. Ralph C. Benedict.

The object of this paper was to present general facts regarding fern hybrids, to indicate the apparent significance of the facts, and to show examples of some native hybrids.

The literature on the subject seems to be very scanty, and consists principally of scattered descriptions of natural and horticultural hybrids. Lowe (Fern Growing) has given a general discussion of the subject but his work is of a horticultural, rather than of a scientific, value. The most conclusive experiments are those carried on by Miss Margaret Slosson, in which she reproduced culturally *Asplenium ebenoides* (*A. platyneuron* × *Camptosorus rhizophyllus*), and *Dryopteris cristata* × *marginalis* Davenport, two suspected hybrids, which occur in nature. Recently at least one more cross has been artificially produced by Mr. Amedee Hans, of Stamford, Ct., between *Dryopteris Filix-mas* and *D. marginalis*. This, however, has not yet been found wild.

Study of these three authenticated hybrids shows that they agree in general with the hybrids of some flowering plants. They are sterile, usually larger than the parents, sometimes abnormal, and in many characters intermediate to a greater or less degree between the parent species. In view of these facts, it seems reasonable to interpret as hybrids other forms (principally in *Dryopteris*) which are sterile and similarly intermediate between two species.

Some of these are very characteristic and might be considered separate species. At least two have been so described. This view, however, is untenable because of their sterility, and their distribution, rare or occasional with the parent species, or at least

in a locality where these grow or have grown. That they are mutations seems very doubtful, because the actual differences are so great, and especially since in these differences they resemble the other reputed parent. For example, sterile intermediates are known between *Dryopteris marginalis* and six other species. Some resemble *marginalis* most, some the other species, but all agree in possessing distinctive characters of each of two species. For similar reasons, these forms cannot be satisfactorily explained on ecological grounds.

If it is objected that fern hybrids must, because of the conditions required for the transference of spermatozoids, be too rare to account for these plants, which are rather common, it may be said that *Dryopteris cristata* × *marginalis*, one of the authenticated crosses, is perhaps the commonest of them all. It may be expected in any swampy woodland where the parent species occur. This being the case, we are bound to expect the other forms to be found at least occasionally, and it seems only logical to conclude that such intermediate sterile forms as are analogous in general characters to *D. cristata* × *marginalis* belong in the same category and are likewise hybrids.

In the region in which the writer has studied these plants, *Dryopteris* is represented by six specific units which seem to hybridize more or less readily, representing a total of fifteen possible combinations of two species. Of these fifteen, two are already described. Of the remaining, probably eleven have been found, and descriptions for most of these are in preparation, some by Miss Slosson, some by Dr. Philip Dowell, and some by the writer.

Both papers were discussed at length, and the Club adjourned at 5:45 o'clock.

C. Stuart Gager,
Secretary.

March 10, 1908

The meeting was called to order at the American Museum of Natural History at 8:30 p. m. by the Chairman of the program committee. There were twenty-five persons present. In the absence of all officers of the Club, no business was transacted. The scientific program consisted of an illustrated lecture entitled

"On horseback through Hayti," by Mr. George V. Nash,* and was listened to with great interest by all present.

Adjournment was at 9:45.

TRACY E. HAZEN,
Secretary pro tem.

OF INTEREST TO TEACHERS

The sixth question suggested in the March number has enlisted many interesting letters. This issue contains but part of them; other letters referring to this and to the remaining questions will be printed later in TORREYA. The wide range in the letters is in itself suggestive.

The question here discussed is:

Why does not the study of botany more often create a lasting interest? Would this be secured by more emphasis on morphology, including classification?

Perhaps one reason more lasting interest is not secured is because there is so little that even the interested high school pupil can do by himself after completing his half year or whole year course in botany. Reading alone will not serve as in history, literature and foreign languages. The second part of the question was added with this difficulty in mind.

I

The following is a qualified answer for I do not feel that I can answer the question for more than the students under my own observation.

For boys of the age when they come to the De Witt Clinton High School (13 to 15), I believe the more laboratory physiology or perhaps I should say the more simple experimental work and demonstration we give in elementary, physical, chemical, and biological science, the greater the interest. Things morphologic or taxonomic seem to gain and hold interest with but few; modifications and adaptations in structure interest more students; simple experiments with a definite problem put before the student

* Instead of the usual abstract Mr. Nash has written a short article on the mangrove which appears upon another page; other interesting accounts of the same trip are to be published later in TORREYA.

to be worked out at home or in the laboratory almost never fail to gain interest and coöperation from our students.

George W. Hunter.

De Witt Clinton High School,
New York City.

II

One reason that the interest aroused by the average high school course in botany is not deeper and more lasting is that we try to cover too much ground and touch upon too many topics. If a young person is to follow a subject for his own pleasure he must feel to a certain extent that he has command of it. The mountain view is certainly broader and contains more that is interesting, but one feels no sense of possession and there is no starting point for activity.

One teacher when questioned looked up in surprise and said, "We teach only the fundamental principles as it is!" Where do "fundamental principles" end and can they all be taught in a course covering half a year to pupils who are strangers to science and who are only children? Botany itself is divided into half a dozen sciences; why not divide the "fundamental principles" similarly and try to teach only *one* branch. Any attempt at condensing a subject usually results in cutting out the most interesting part and leaving the dry bones.

It would seem that the question as to whether this narrower, more intensive course shall be mainly physiology, morphology, or classification, must depend upon the teacher, the pupils and the environment. As to classification, I would add that it is the department of botany which can most easily and most naturally be followed in an irregular way by a person with little preparation, a small outfit and odd minutes. But whether in any given school a course of that kind can be given with advantage, each must decide for himself.

Stella G. Streeter.

Jersey City High School.

III

To the first question I should be inclined to say that all our botanical courses and text-books intended for high schools are too technical, philosophically morphological and scholastic for high

school use. They are all written by technical botanists who have forgotten that they were ever young themselves. They are all much more "complete," difficult, and fatty-degenerated with unessential detail than their authors ever tackled in their own college courses. All this is apart from any vital human interest, and, naturally enough, the pupils, when they pass their examinations, lay it aside with a feeling of relief.

The old classification-key-analysis botany of two generations ago has died a natural death, as the little knots of grandmothers, who used to gather of summer afternoons to "analyze flowers" — the same ones over and over again — have been laid to rest; and there is neither hope, nor occasion to resurrect it. If I add that I have never been able to discover anything in ecology which could serve any purpose in high school botany other than to make life a burden to the students, we may consider the fringes of the first question sufficiently treated. The main problem: Why not a more lasting interest? would require more time than I, and more space than you, have to spare. But, in a single word, if we hope to awaken interests that shall live and grow with the mental life and growth of the pupil, we must select the matter which has the most vital human interest. In other words, it is absurd to expect everyone to become an enthusiastic technical botanist, but there are certain vital, fundamental, and universal interests in plants out of which technical botany has developed, in which all may reasonably have some share. Acquaintance with common wild flowers and common weeds, coupled with the idea of preserving species in danger of extinction or of exterminating undesirable species, appeals to me as one line of such common human interest. Knowledge of the esthetic possibilities of all sorts of wild and cultivated flowers, vines, shrubs, etc., is another line of perennial and wholesome interest. For this acquaintance work by all means let us have simpler keys, if possible, and let them include cultivated plants. Principles and possibilities of plant breeding is another line of interest well calculated to open up into wonderful botanical pastimes later on in life. Acquaintance work should extend to the algae and especially to the fungi — mushrooms, poisonous and edible, important parasitic forms of forest, orchard,

garden, and field, and the life histories of common household moulds and bacteria. Much of this should coördinate with hygiene, home, and community sanitation, and the great movement for national health ; and, if this is done, there will be no danger of interest flagging after once being kindled.

Local and national forestry problems, timber resources and water conservation and the knowledge of trees in relation to landscape improvement and roadside planting are other blocks of general human interest which the high school course in biology on the plant side should utilize to the full.

All the above suggests making high school botany strongly biological, and this seems to me to be the tendency both abroad and in this country. Physiological botany, excepting a very few fundamentals related to cultivation and plant breeding, I should think ought to await the college and university courses.

C. F. Hodge.

Clark University,
Worcester, Mass.

IV

It is not easy to answer this question in a few words. There may be several different reasons why the subject of botany does not "more often create a lasting interest," some of which may apply with greater force to one school system than to another. It makes a difference, too, in which year of the high school the subject is taught. In what is said below, it is assumed that the course is given in either the first or second year of the high school.

It seems to me that one reason why botany does not arouse a more lasting interest in the pupils lies in the general lack of knowledge on the part of teachers of the nature of the pupils they are aiming to instruct. It is not that the teachers do not know their subject, but that they do not know their pupils. The high school teacher of science fresh from his college training has had no practice in the art of teaching, but this defect time will remedy. He has no adequate knowledge, usually, of psychology, especially child psychology, and without this he is unable to understand the adolescent in his true perspective, as related to the child that was, on the one hand, and to the man or woman

that is to be, on the other. Of course, a teacher soon learns to make many adjustments to the needs and capabilities of his pupils, and, indeed, is forced to do so, but in general the teacher's own college science course is only slightly modified to fit the high school pupil, and the result is a misfit. The high school needs the help of broadly-trained men and women to make its work serve better the needs of its pupils; not only is this true in the science work, but in other lines as well.

Looked at from this point of view the remedy for the lack of real and lasting interest in the botany work would certainly not be to add more morphology. That is quite the worst thing that we could do. Nor would it help to provide more artificial keys for the identification of plants, in the hope of stimulating interest through plant analysis. Neither should I advocate more ecology or more plant physiology, considering these merely as subdivisions of the science of botany.

The remedy lies, it seems to me, more in relating botany to the other life-sciences — zoölogy, including human physiology, particularly hygiene, thus making it a body of organized knowledge of the greatest value and interest to the adolescent. If given in the second year of the high school, it should follow a course in general science, given from an evolutionary and synthetic point of view. There are many problems in connection with such a course. Of these, I may mention three: first, how to bring the work in close touch with the life of the pupil and make it an influence for good, for example, in inculcating the love of out-of-doors, or in affecting personal and social sanitation; second, how to select for emphasis the evolutionary factors or elements which serve to bind the whole into a consistent body of knowledge, eliminating the useless details; and third, how to present this body of knowledge historically, as itself an organic growth now only in its infancy. Were these problems in teaching solved I believe there would be no question as to the practical value of botany, nor as to the interest aroused at high school age, nor as to the permanancy of this interest in a relatively greater number of pupils than at present.

HENRY A. KELLY.

ETHICAL CULTURE SCHOOL,
NEW YORK CITY.

V

The ordinary student in our secondary schools usually receives but one half year instruction in botany. A large part of that half year is generally consumed in learning terms, an uninteresting task in any subject. By the time a working botanical vocabulary is obtained, little of the five months remains in which to find the real meaning of the subject. At the end of the half year, some other branch is substituted for this one and the little that is learned of botany is soon forgotten, while a continuation of the study for another half year might have led a number of students into more lasting sympathy with the subject. The teacher as well as the pupil finds the results of this short period unsatisfactory, and only the occasional student has obtained sufficient interest to lead to a pursuance of the study beyond the classroom.

The entrance to the high school opens up to the student at this formative period in his career a variety of attractive lines of study and possibilities for life work. The boy's leading is usually toward the "practical" studies, as mathematics and the physical sciences, the girl's toward literature and languages, and the assistance of these subjects in earning a livelihood has its effect upon the student's likes and dislikes, as well as upon his choice of subjects in the elective course.

The half year botany is frequently given in the first year when everything is comparatively new. In this crowded period of mental confusion and adjustment, when the student is adapting himself to new methods of study and instruction, its importance to him is lost. Even if given later in the course, it is seldom allowed the importance in the curriculum that other subjects, such as algebra, latin, geometry or literature, have. It is hence considered a minor subject, a study for "girls," as one high school boy expressed it. If required, the student in many cases takes the subject to "pass" it; if elective, because it "sounds easier" than some alternative.

To sum up: The study of botany does not more often create a lasting interest because of—

1. The unfortunately crowded period in the pupil's life when it is introduced.

2. The short amount of time devoted to it when the subject is given; hence —

3. The superficial or technical manner in which the subject is taught.

4. The lack of immediate or close relation to the pupil's life, thought and needs at the time when it is introduced; hence not sufficient interest is created for that interest to be lasting.

Although these conditions exist in many localities, in others they are being partially met by the introduction of plant study into the elementary schools. When the child, unaccustomed to some plant study earlier in his school life, begins his half year of botany in the high school, he must spend time in learning what to see and how to see it, as well as the application of the terms required. The child, accustomed to the observation of a plant in the elementary school, has already learned to see, at least in an elementary way; he has learned a few necessary terms; he has gained a foundation upon which to build his half year botany. He takes up the subject, now to be treated more technically, with an interest already created, and is ready to add to this foundation built in a natural way.

The introduction of the microscope before the student has learned to use his powers of observation with the unaided eye, the use of alcoholic and dried specimens with the beginner, and the study of plant parts without first considering the plant as a whole, all tend to deaden an interest that should continue beyond the botanical classroom. An intimate acquaintance with a few plants made in a proper manner and an introduction by name to as many plants as possible will place at the student's disposal a basis for continued interest.

For a few years past, I fear we have swung the pendulum too far from the value of the name of an object. The child, or ordinary grown person for that matter, wants a name for the thing at hand. He will recognize no other introduction. Further acquaintance may prove desirable, but he must first have the name. Therefore, I make a plea for means of simple classification leading to common names for common things. What's in a name? It may be the entire interest in a subject; at least, the

lack of a name may cause a plant to go unnoted a long time, while the name alone may lead to further acquaintance never otherwise obtained.

Simple keys for tracing trees, flowers, etc., including the common cultivated plants, will take away one of the greatest drawbacks to finding the name of a plant, that is, the knowledge of difficult technical terms and the dependence of a determination upon some seasonable condition distinguished with difficulty.

Therefore, to create a more lasting interest in botany:

1. Introduce the subject earlier in the pupil's life.

2. Let the required amount of time given to introductory work be increased.

3, Have the basis for study comprehend a few types, including some closely related to student's life.

4. Learn by name as large a number of plants as possible.

LAURA WOODWARD.

HEWITT TRAINING SCHOOL,
TRENTON, N. J.

Symons's Monthly Meteorological Magazine for November, 1907, describes a unique hygroscope designed by John Aitken. The petal of one of the so-called everlasting flowers is attached to a stiff hair, which serves as a pointer, and the petal and hair together are fastened on a dial, set in a metal case. The instrument is about as sensitive as a hair hygroscope, but more compact and cheaper.

The Committee on the College Entrance Option, Professor W. F. Ganong and F. E. Lloyd, presented a report at the second annual meeting of the federated societies (the fourteenth of the Botanical Society of America), held in Hull Botanical Laboratory, at the University of Chicago, December 31, 1907. The committee recommeded that a somewhat revised fourth edition of the high school course now used as a basis for the college entrance examinations in botany be printed, and that the committee confer with the American Society of Zoölogists in formulating a high school course in biology.

The "birds-eye maple" is discussed in *Science*, March 27, 1908. The solution of Dr. A. W. Borthwick, of Edinburgh, is

given, and another theory * as to the origin of these peculiar markings is added to those already known. Dr. Borthwick thinks that this peculiarity is due to the formation of adventitious roots upon the stem, and that these arise from abnormal medullary rays. In none of the cases examined (with possibly one exception) were such roots due to mechanical injury, or the attacks of fungi or insects. While the conditions which govern the production of adventitious roots are not certainly determined, he is sure that moisture is an important factor, as it is "only in the moistest situation that they persist for any time after they pierce the periderm."

NEWS ITEMS

Mr. Norman Taylor, who has been an aid in the New York Botanical Garden for several years, has been appointed custodian of the garden plantations.

Ira D. Cardiff (Ph.D., Columbia, 1906), professor of botany in the University of Utah, has been elected president of the recently organized Utah Academy of Sciences.

Mr. A. K. Chittenden has been appointed assistant in the U. S. Forest Service to investigate the White Mountains and the Appalachian Mountains in regard to the proposed national park.

* *Ackerman's Repository*, an old English journal of "Arts, Literature and Fashions," published in 1825 an article on "Botanical Theory" which is interesting in this connection. The italics are ours. "This marking is an excellence not peculiar to any one tree, but is occasionally met with in the maple, citron, yew, ash, beech, lime and other trees. A knowledge of the particular time when trees may be expected to exhibit such figured appearances, seems to have been a secret confined to very few, who, by thus having the command of the market, contrived to keep up the prices. To the discovery of this secret, the fair botanist [Mrs. Ibbetson] has been led by her researches in support of a theory which she has the honor of *originating*: namely, that the buds of trees *ascend* from the *root*. Willdenow thought that they were formed in the bark; Mr. Knight says that they originated in the alburnum next the bark. 'Pliny's description of the *bruscum*, so prized by Romans in their tables,' says Mrs. Ibbetson, 'immediately brought to my mind the different figures of the roots of various trees, when cut down at the proper season, for this does not last above a fortnight or three weeks at most in any tree; but if taken within that time, most roots form a very beautiful picture.' This she contends may be attributed to the various grouping of the buds, as they are about to *start*, or have *started*, from the *root* on their progress up the different layers of the wood to the exterior."

The University of Iowa has received from Mrs. L. V. Morgan the botanical collections of her husband, the late Professor A. P. Morgan. The mycological specimens in the herbarium are very valuable, because of Professor Morgan's own work in that line.

Mr. M. Rothkugel, of the U. S. Forest Service, has gone to Porto Rico for three months, to study the conditions there, and to outline a course of management for the Luquillo National Forest, the only insular national forest belonging to the United States.

The new Pacific Scientific Institution which has its headquarters at Honolulu is planning extensive explorations of the Pacific Ocean for the next fifteen years. The work in botany will include the establishment of an acclimatization botanical garden in Hawaii.

The fifth annual field "symposium," in which the Philadelphia Botanical Club, the Washington Botanical Club, and the Torrey Botanical Club will coöperate, will be held at Georgetown, Delaware, July 6 to 12. Particulars as to headquarters, etc., will be announced later.

Professor Herbert F. Roberts, of the Kansas State Agricultural College and Experiment Station, has been commissioned by his home station to spend the summer inspecting the wheat regions of central and southern Europe in search of superior sorts of hard wheats for introduction into Kansas.

The centenary of Darwin's birth is to be celebrated at Cambridge, England, in 1909. A chair of biology is to be established, partly through the anonymous gift of £300 a year, which is contributed upon the condition that the professor shall either teach or make researches in heredity.

Mr. C. G. Pringle, keeper of the herbarium of the University of Vermont and the veteran botanical explorer of Mexico, is planning to make an expedition to South America in the near future. He intends to go by way of Mexico and Panama and expects eventually to reach the Andean region of Colombia and Ecuador.

TORREYA

May, 1908

Vol. 8. No. 5.

BOTANY.*

By Herbert Maule Richards.

As you have heard in previous lectures, there is an increasing tendency on the part of biologists to segregate less sharply the physiological and morphological fields of work, to take a broader view not only of the content but also of the methods of the two branches of biological investigation. It must not be supposed, however, that in this tendency towards coöperation there is a return to omniscience of the type of the old-time naturalist, who by reason of the lack of detail was able to consider himself proficient in many branches of science. The modern morphologist must still be a morphologist, and the physiologist a physiologist, only he has a broader point of view and does not hesitate to avail himself of the cognate branches of his science, or of any other science, where he feels that he can further the aims of his researches; he is an eclectic and picks that which will serve to advance his work along the most fruitful lines.

Almost any investigation of wide scope is in these days an example of this improved attitude, but no other perhaps illustrates so conclusively what may be called the highest type of modern research as does the development of the Mutation Theory first propounded by de Vries. What de Vries has really done is to bring within the range of experimental proof certain questions which heretofore have been regarded as matters of observation and speculation alone. From this point, which might be said to have had its origin in the acuteness of observation of the taxonomist and morphologist, the physiological trend has

* A lecture delivered at Columbia University in the Series of Science, Philosophy, and Art, December 4, 1907, copyrighted and published by the Columbia University Press, February, 1908, and reprinted by permission in Torreya, beginning with the March number.

[No. 4, Vol. 8, of Torreya, comprising pages 65–92, was issued April 29, 1908.]

ever increased until the last word in this discussion may perhaps be for the physiologist alone. The great question involved in the Mutation Theory is the old, old problem of the origin of species, a very considerable advance in which has been made by de Vries and those who were stimulated by his work. It is quite wrong to suppose that he has controverted the general results of Darwin's work ; he has supplemented it, brought it within the range of more conclusive proof.

As the Linnaean or collective species may be regarded to-day they are usually separable into several more or less distinct strains which show no intergrading forms, and the diagnosis of any one species is, so to say, the average impression of them. To these distinct strains de Vries has given the name elementary species, and according to his interpretation they are the really discrete, finally segregable units, between which no intermediate types exist and concerning the origin of which we are really concerned. It matters not whether it was through ignorance or simply from convenience that the earlier taxonomists grouped many of these forms into a single species ; we must conclude, that in general species, as recognized by the books, are quite artificial. It matters not, also, what we call these finally not further resolvable forms. Therefore let us accept de Vries's terminology and use the term elementary species ; the real point of the inquiry is how did these forms arise. It is upon this that de Vries's work has thrown a great light. He has shown that they may arise suddenly and without previous preparation from preëxisting forms, in which case the elementary species may be termed mutants, and the theory which has to do with the investigation of their origin the Mutation Theory.

The next task then is to examine more closely the methods which de Vries employed, the evidence which he has to support his views, both as to the observations on the origin of these mutants and their behavior after they have come into being, and further, what success subsequent investigators have had in supporting de Vries's evidence, and how far they have extended his conclusions. In the first place, it may be remarked that the conclusions as first published in 1901 and 1902 were not the

outcome of any hasty experiments and ill digested data, but were the result of seventeen years of the most careful and painstaking work, and a fine example of the best kind of quiet, faithful research, removed from the rush of affairs and the demand for immediate results, the final conclusion of which fully warranted the time and labor expended.

As is well known, Professor de Vries found in Lamarck's evening primrose — *Oenothera Lamarckiana* — a plant most favorable for observation, though his conclusions are not based on that form alone. The most carefully guarded pedigree cultures were made from the true *Lamarckiana* type, and the astonishing result developed that among the offspring of these certain forms, to the number of about 4 per cent., showed new and striking differences. In all, more than a dozen new forms were obtained which, if they could be bred at all, bred true to their new characters and did not revert to the ancestral *Lamarckiana*; these were the mutants, the new elementary species, which had sprung suddenly in a saltatory fashion from the parent stock. The great importance lies in the fact that they were entirely constant to their new characters and were thus not in the class of the merely unstable varieties. It must be remarked that time alone, many generations, of carefully guarded cultures in which accidental crossing was an impossibility, together with unimpeachable records, could adequately establish this momentous fact, that here was a new species, a new form, or whatever you may elect to call it, which had sprung all in one jump from its parental stock. De Vries, then, was the first man who ever saw a new type of organism come into the world and who recorded its advent.

You naturally ask how unlike were these new forms, a question which is difficult to answer without actual illustrations. However, it may be said that many of them were different enough from their parent stock to be admitted by taxonomists to come within the definition of new species, as species are regarded at the present time. The differences are not the question of mere stature, but of the whole habit of the plant and of the details of the form of both leaves and flowers. But to repeat, it really makes no odds

whether the differences are of such quality that they must needs be recognized as specific by taxonomists; what is important is that they are differences which do not intergrade one with another and which are inheritable in the second, third, and subsequent generations, and that no tendency to revert to the parent form is to be observed.

The results of de Vries have been verified by cultures in this country of his own and of other stock, so that there can be no question that this Lamarck's evening primrose behaves in its manner of mutation the same here as elsewhere. More than that, other mutating forms have been discovered, and by the application of biometric methods much that is important regarding the relative variability of mutants and their parent stock has been determined. Besides the actual experimental work, the history of Lamarck's evening primrose has been traced back for more than a century and a mass of inferential data is being accumulated which helps to support the main conclusions. Important as all these advances are, the most brilliant result is that obtained along the lines of the induction of mutations. By injecting into the developing ovary of a plant allied to Lamarck's evening primrose reagents which might produce a chemical or osmotic effect upon the cell contents, MacDougal has actually succeeded in inducing mutations. The seed grown from the stimulated plant may produce forms quite distinct from the parent type and, what is essential, the mutations thus induced are constant to the second and third generations. That such a result can be obtained is simply astounding when one considers how firmly an organism is bound by its heredity. It would appear that a tremendous shock had been given the plant at a critical period in its life history which has enabled or forced it to break down some of the minor barriers imposed by its hereditary tendencies and to erect new ones, which circumscribe its offspring as the original ones did its parent. As to the precise nature of this shock we can at present only speculate, but it is permissible to suggest that it is perhaps of the nature of the rearrangement, in a chemical sense, of the protoplasm of the cells of the sexual generation. As to the natural production of mutants, given such a conception of the nature of the process

involved, it is possible to suggest various ways in which it might have been brought about.

The line of departure of mutants from the parent type is not in any one direction, and the manner of variation appears to be wholly a matter of what we are pleased to call chance. As has been said, de Vries obtained more than a dozen different forms. Some of the mutants, we may say, are probably destined to failure, others perhaps are better placed, at least in new environment, than the parental type and might conceivably stamp it out in time. What the criteria of success or non-success may be is a matter upon which no one would care to give an opinion, but I have in mind the fact that one of the mutants of Lamarck's evening primrose has a tendency to germinate somewhat more quickly than the parent form, and the seedling grows a little more rapidly; it is conceivable that some slight advantage of this sort might be the crucial point. However that may be, it is here that we can apply the Darwinian concept of the struggle for existence, a struggle however not between single individuals, as the idea of continuous variation would imply, but the struggle between great numbers of individuals, whole groups of elementary species. The great contrast between Darwin and de Vries is the contrast between the slow and continuous accretion of variations implied by the former and the sudden jumping or saltatory variation insisted on by the latter. By such means as de Vries maintains the process of evolution might take place with far greater rapidity than by Darwin's method, for, generous as the geologists are in their allowance of time for the development of organic life on the world, it has always been difficult of conception how even the countless ages granted could compass the enormous development of the highest organic types from simple forms. To maintain that de Vries's theory is entirely complete, and must be the only means of the origin of new forms, is unnecessary. None but the extremists would go to such a length; it is not at all necessary to assume that the means to a similiar end must necessarily be similar. What may be maintained, and properly so, is that mutation constitutes one way, at least, by which new forms of organisms may arise on the world's surface. New forms, in the

sense of the new combinations of old characters which come into being by reason of stable, non-reverting hybrids, are known to have originated, but such new forms imply of course the preëxistence of varied types, and do not have to do with the question of the origin of new characters.

It is not in the order of things that a new theory of such import as the Mutation Theory should not find opponents. These I think may, in the main, be grouped in three classes. First, the critics who doubt the evidence, who can be answered by referring them to the printed records, and recommending a repetition, as careful as the original work, of the experiments which have led to the new point of view. Second, those who quibble concerning terms, and this type I think constitutes the majority, who will likely suffer the fate that is usually meted out to quibblers, that of being ignored. Lastly, those opponents who, while they may not doubt the accuracy of the work doubt the conclusions on philosophical grounds. These are the critics whom the advocate of the de Vries Theory must welcome and who will arrest his sober attention, for they will stimulate him to accumulate more and more evidence to support his position. Even were I able to analyze adequately the controversial side of the question for you, it is obvious that time scarcely allows, and I will, in consequence, state frankly that the account which I have presented is from the standpoint of an advocate of what the Mutation Theory teaches, and add that I am not aware that any experimental work has controverted it. Let me say, however, and here I wish to speak for myself alone, that I cannot see it makes great odds whether fifty years hence or five years hence we accept the Mutation Theory just as propounded by de Vries. The great point is that an advance has been made, the most important advance since the time of Darwin, by way of helping to elucidate one of the great questions in which man is interested. It is not to be supposed that we have as yet any final answer to this question; final answers are not indeed the goal of any one scientific research. It was Sir Isaac Newton, I think, who said that the seeker after ultimate causes did not show the true scientific spirit, and he was right. What we have is one of the proxi-

mate causes demonstrated to a degree which had not been previously attained. A scientific theory is like an organism, it grows and it may also propagate itself, and all the theories of evolution from Lamarck to de Vries, and those that will follow, will themselves be an example, as it were, of the principle that they teach. A theory which starts life an intellectual pigmy, may develop, if it have the vitality, into a veritable intellectual colossus, and, after it has run its course, may leave behind its offspring. It is not a cause of reproach but rather of congratulation that the scientific theory of to-day may be discarded to-morrow, for no theory will be abandoned until a better one has been brought forward to take its place, one which can explain the facts in a way more satisfying to the human mind. Change in such a case is progress, and since science must of necessity be always progressing so also must it be always changing.

To those who are conversant with the problems connected with the origin of species, it must be obvious that this consideration of the subject does not cover the whole ground; so obvious, indeed, that perhaps it is unnecessary for me to remark that it is not intended to. There are other theories to be considered and other equally important matters that are more or less interwoven with any one theory of the evolution of new forms. Thus no reference has been made to Mendel's researches on heredity, or the way in which they touch upon the de Vries Theory. This has been omitted purposely, for while the results of Mendel's original experiments in the breeding of peas might be cited at length, I doubt if an apter or more significant example could be found than the one which Professor Wilson used, and as Professor Wilson himself said, the explanation while not abstruse is one that requires considerable preparatory consideration. The Mutation Theory has been developed more in detail, as representing a type of research. Being one of the latest and most important contributions to biological science, and being also entirely germane to the subject in hand, it has seemed proper to devote some time to its consideration. At many points do the fields of modern botany and modern zoölogy touch, but perhaps it is nowhere so evident as in great problems like these. Here

the two sciences work in generous rivalry, each eager to add its contribution to the store of general knowledge, to utilize such information as the sister science brings, to criticize it if need be, but always to accord it a respectful hearing.

(*To be concluded.*)

STUDIES IN THE OPHIOGLOSSACEAE—II

A Descriptive Key to Botrychium in North America: Group of B. lanceolatum

By Ralph Curtiss Benedict

The present treatment is designed to set forth briefly the essential facts of our knowledge of these plants from a taxonomic standpoint. The status of the various units included is not considered. The question of specific limits is a perplexing one throughout the genus, and one which will probably require cultural work, such as the raising of the various forms from spores, and under varying ecological conditions, to settle it satisfactorily. But additional information gained from field and herbarium study will be of value, and any corrections and additions to the account given will be welcome.

For convenience, the genus may be divided into two groups, typified in general by the species *B. lanceolatum* and *B. ternatum*, respectively, and characterized as follows:

Group of *B. lanceolatum:* Bud hairless (*B. virginianum* excepted); commonstalk one-half or more epigean (*B. pumicola* excepted), usually one-half or more the height of the plant (*B. simplex* excepted); spores maturing from late spring to early summer (May to June). Included in this group are the following: *B. simplex* Hitchcock, *B. pumicola* Coville, *B. boreale* Milde, *B. onondagense* Underwood, *B. Lunaria* (L.) Sw., *B. tenebrosum* A. A. Eaton, *B. neglectum* Wood, *B. lanceolatum* (Gmel.) Ångstr., *B. virginianum* (L.) Sw., *B. dichronum* Underwood.

Group of *B. ternatum:* Bud hairy; commonstalk hypogean, short, usually less than one-quarter the height of the plant; spores maturing from the middle of summer to early fall (July to October) (three exceptions).

The above grouping is probably a natural one, but the proper rank of the two groups and their relationship to each other are problematical. The plants included in the first division fall naturally into three or four evolutionary series, starting in each case from the simplest species in the genus, very appropriately *B. simplex*. But this species may also represent the origin of the second group, and some writers have preferred to place it in this section because of its short commonstalk, and occasionally subternately divided lamina. However, it is surely more closely related to species in the first group, notably *B. tenebrosum*, through which it is connected with other forms of the same general type. No real connecting species is known between *simplex* and the species of the *ternatum* group. The latter form a unified and natural section and have even been given generic rank, but on insufficient data. H. L. Lyon * noted a considerable difference in the development of the young sporophyte of *B. obliquum* on the one hand, and of *B. simplex*, *B. neglectum*, and *B. virginianum* on the other. This difference is interesting, but it cannot be considered of value, even to separate the groups, unless it is shown to be constant for other and diverse species in both groups.

Two other groupings of the species have been made. Milde recognized two subgenera, *Eubotrychium* and *Osmundopteris*. The latter included only *B. virginianum*, and was based on a very artificial character, the fact that in this species, the bud-sheath is partly open. Prantl divided the genus into groups nearly like those used here, but differed in placing *B. virginianum* with *B. ternatum* and others of that type to form his subgenus *Phyllotrychium*, of which the principal distinctive character is the possession of a hairy bud. But *B. virginianum* seems to find its closest affinities with *B. lanceolatum*, and it is more reasonable to suppose that it represents an extreme development of this type than to relate it to the much more different *B. ternatum* group.

In the key that follows, the difficulties in connection with the two smallest species, *B. simplex* and *B. pumicola*, are met by giving descriptions sufficiently complete to prevent the confusion of mature specimens of other species with these, but it is prob-

* Bot. Gaz. 40 : 455–458.

ably impossible to draw up a synopsis or descriptions which will differentiate the very young and immature forms of *B. simplex* from similar forms of *B. tenebrosum* and *B. matricariaefolium* and perhaps others. The identity of such forms can usually be ascertained from the mature plants associated with them. As regards the most closely related units, these are in each case keyed out in pairs, so that doubtful specimens may be traced at least to one of two.

Commonstalk about one-half hypogean, the lamina straight in vernation, entire to once or twice pinnately or sometimes subternately divided into cuneiform to lunulate, usually separated segments; the sporophyl straight in vernation, long-stalked, often one-half to two-thirds the height of the plant (in meadows and pastures, northern North America, Europe, and Asia). 1. *B. simplex* Hitchcock.

Commonstalk all or nearly all hypogean, lamina with the tip bent down in vernation, once ternately divided, the divisions pinnately divided into cuneiform to lunulate, crowded segments; the sporophyl erect in vernation, short-stalked, scarcely exceeding the lamina (in pumice soil, 9000 ft. elevation, Oregon). 2. *B. pumicola* Coville.

Commonstalk nearly all epigean.

- Lamina oblong to ovate or narrowly deltoid, with only the tip or upper part bent down in vernation; the sporophyl erect or with the tip bent down.
  - Lamina with the tip bent down in vernation, but not clasping the sporophyl, ovate to deltoid, acutish, sessile, usually only once pinnately divided, the segments rhombic to deltoid, acutish (Alaska, also in Europe). 3. *B. boreale* Milde.
  - Lamina with the tip bent down in vernation and clasping the sporophyl, oblong, rounded, usually sessile or nearly so, only once pinnately divided with fan-shaped to lunulate segments.
    - Plants usually slender, lamina narrowly oblong, the segments fan-shaped, distant (central New York, northern Michigan, and Montana). 4. *B. onondagense* Underwood.
    - Plants usually stout, lamina usually broader, the segments lunulate, often close and imbricate (northern North America and Europe). 5. *B. Lunaria* (L.) Sw.
  - Lamina with the tip or upper part bent down in vernation and clasping the sporophyl, oblong to ovate or sometimes deltoid, usually stalked, entire to twice pinnately divided with cuneiform, oblong, or ovate segments.
    - Segments mostly cuneiform; sporophyl erect in vernation (in wet woods, northeastern states and Canada). 6. *B. tenebrosum* A. A. Eaton.
    - Segments mostly oblong or ovate, the sporophyl with the tip bent down in vernation (usually in dry ground at the edge of woods and thickets, northern North America and Europe). 7. *B. neglectum* Wood.

Lamina broadly deltoid, and, with the sporophyl, entirely bent down in vernation, sessile or nearly so.

Bud smooth, in a closed sheath, plants 5–32 cm. high, lamina 1–6 cm. long, 0.8–9 cm. broad, 1–2 or rarely 3 times divided, the sporophyl short-stalked, about one-fourth the height of the plant, the panicle usually stout and diffuse. 8. *B. lanceolatum* (Gmel.) Angstr.

Bud hairy, in an open sheath, plants 8–80 cm. high, the lamina 2.5–35 cm. long, 4–42 cm. broad, 3–5 times divided, the sporophyl long-stalked, one-third to one-half the height of the plant, the panicle slender.

Lamina annual, panicle slender (continental North America, also in Europe and Asia). 9. *B. virginianum* (L.) Sw.

Lamina persistent for two to four years, the panicle stouter (Jamaica). 10. *B. dichronum* Underwood.

A treatment of this section of the genus *Botrychium* is hardly complete without reference to Mr. Davenport, and his contribution to our knowledge of some species in it and their relationships. His pains-taking work with *B. simplex*, and his discovery and exposition of the bud characters by which many of the species may be certainly identified, will probably always remain, from a taxonomic standpoint, the most valuable additions to our knowledge of this group.

New York Botanical Garden.

COLLECTING LIVERWORTS IN JAVA

By Douglas Houghton Campbell

Two years ago it was my good fortune to spend over three months collecting in Java, perhaps the most interesting region in the world to the botanical student. Wallace pronounced Java to be the most beautiful of all tropical islands, and one who has visited it is inclined to agree with his verdict. Lying as it does only a few degrees from the equator and possessing an exceedingly heavy rainfall and a volcanic soil of extreme fertility, the vegetation shows a luxuriance and variety that far surpass anything I have ever seen in any other part of the world. This great variety is shared by the lower plants, and the liverworts include many forms of the greatest interest.

Java is extremely mountainous, being largely composed of a range of volcanoes, several of which exceed ten thousand feet in height, and there is great difference in the rainfall at various

points, the heaviest precipitation occurring in the western portion of the island where the famous Buitenzorg gardens are situated. This great range of elevation combined with the differences in rainfall results in a marvellously rich and varied flora. It is said that there are over fifteen hundred species of trees in the island, which in area is little if any larger than England.

Much of my collecting was done in the neighborhood of Buitenzorg and on the Gedeh, a mountain upon which is situated the mountain station Tjibodas, where I spent about a month.

Goebel over twenty years ago visited Java and called attention to some remarkably interesting liverworts, among which was the new genus *Treubia*, one of the largest and most striking forms known. Schiffner (Hepaticae der Flora von Buitenzorg. Erster Band. Leiden, 1900) has described the thallose forms, among which are many new species, but he has not yet published a complete list of the foliose liverworts nor of the Anthocerotes. No doubt many interesting forms will reward further explorations.

As in other tropical countries, the greatest profusion of liverworts does not occur in the hot lowlands but in the cooler and very moist mountain districts. Nevertheless, many striking species are common about Buitenzorg, whose elevation is between two and three hundred meters.

My collections were mostly confined to the thallose liverworts, as these were the ones I wished to study especially. The foliose species, however, are extremely abundant and include a great many striking and beautiful forms. Unfortunately the identification of most of these is very difficult.

The botanical garden of Buitenzorg lies but a few miles from the base of a very striking volcanic cone, the Salak, and nearly every afternoon rain clouds gather over the peaks of this landmark and a violent thunder storm sweeps over Buitenzorg, deluging everything and followed by a marked fall in temperature.

These daily drenchings cause a marvellous growth of all kinds of vegetation and liverworts luxuriate in the steamy hot atmosphere. The garden itself affords many interesting species and the densely shaded gullies and plantations everywhere are crowded with bryophytic growths. Several species of *Riccia*, *R. Treu-*

biana Steph., a large and striking species, being the most noticeable, are common on the paths and upon the ground wherever it is undisturbed, and two species of *Marchantia*, *M. geminata* Rein., Bl. & Nees and *M. emarginata* Rein., Bl. & Nees, are very abundant. Perhaps the most striking of the ground liverworts of Buitenzorg is *Dumortiera velutina* Schiffn., which is closely related to *D. trichocephala* (Hook.) Nees of the more elevated regions, and seems to take its place in the hotter lowlands. Of the thallose Jungermanniales, the most conspicuous form about Buitenzorg is *Pallavicinia indica* Schiffn., allied to the widespread *P. Lyellii*, but considered by Schiffner to be quite distinct. *Metzgeria Lindbergii* Schiffn. was not uncommon on the trunks of trees in some parts of the gardens and seems widespread through the lower elevations. A large *Riccardia* (*Aneura*), *R. viridissima* Schiffn. was also not uncommon. No collection of the leafy liverworts was made in Buitenzorg, but these are abundant upon the trees everywhere in the deep shade of plantations. Several species of *Anthoceros* are very common, growing upon the ground everywhere, but these have not yet been identified. A *Notothylas*, probably *N. javanicus* Nees, is also not rare, but no specimens of *Dendroceros* were collected about Buitenzorg. The latter, growing as it does in masses of mosses and liverworts, is difficult to find and it is not unlikely that more careful search would have brought it to light.

By far the most interesting collecting ground near Buitenzorg is the region about the foot of the Salak. Here in the dense forest and along the walls of the wild gorge of the Tjiapus there is a wonderful growth of liverworts in great variety. Of the forms quite new to me, the most conspicuous was the very striking *Cyathodium foetidissimum* Schiffn. This grows in little caverns and upon densely shaded rocks, and owing to some peculiarity of the cell-structure the light is reflected from the large chromatophores so that the plant gleams with a vivid emerald light. When handled it emits a very pungent odor like creosote, which clings to the hands tenaciously. The most interesting find was a lot of an *Anthoceros* which proved on examination to have multiple chromatophores, like a fragment which I collected some

ten years ago in Jamaica but had not found since. As this was one of the forms I was especially looking for, its discovery was the event of this interesting expedition. This has since been made the type of a new genus, *Megaceros*. Another undescribed species of the same type was found afterward in the more elevated region about Tjibodas.

Lying on the slope of the magnificent volcanic mass Gedeh, is the mountain station Tjibodas, a dependence of the great garden at Buitenzorg. Tjibodas comprises a garden where are grown many plants of temperate and subtropical regions, and includes a laboratory with living accommodations for four persons. The elevation of the garden is about fourteen hundred meters and I found the temperature almost cooler than I liked after the hothouse temperature of Buitenzorg. The thermometer seldom rises above 20° C. and as it is apt to be foggy and rainy, it is often decidedly chilly, especially in the morning and evening. But in this cool moist atmosphere liverworts revel and I have never seen anything to approach the hepatic flora of this mountain.

From the garden up to the summit of the highest peak, Pangerango, which is ten thousand feet high, is an unbroken primeval forest of wonderful beauty, and overflowing with botanical treasures of every description. For a long distance beyond the garden, which abuts directly upon the forest, a series of paths have been cut through the forest, and these are numbered so that one runs little danger of getting lost in the dense jungle, which without such paths would be quite impenetrable. Many of the finest trees are labeled and several thousand of them are numbered. Otherwise the forest has been untouched.

The paths in the garden and the sides of the banks were often densely overgrown with masses of *Marchantia* and *Anthoceros* of several species. Of the former the most conspicuous was *M. nitida* Lehm. & Lindenb., a large light-green species growing in extensive mats. Several others also occurred.

It was in the forest, however, that the great majority of the forms grew. I naturally was anxious to collect *Treubia* and found that the native collector Sapihin was well acquainted with this ; so very soon after my arrival at Tjibodas we started out in

quest of this interesting plant. After a walk of perhaps a couple of miles along one of the main paths skirting the edge of a deep gorge through which flowed a considerable stream, of which only now and then one caught a glimpse through the thick tangle clothing the sides of the gorge, we arrived at our destination. Every few minutes one stopped to gather some rare and beautiful plant. The sides of the path were covered with fine mosses and liverworts, the trunks smothered in mats of liverworts and ferns with all sorts of epiphytic growths among them. Flowers were not very abundant, but yet there were some that would attract the most unobservant eye. A *Gordonia*, a tree loaded with big white blossoms like Cherokee roses, was very common, and often, close to the ground, the bright red cone of a Zingiberaceous plant, an *Elettaria*, caught the eye, or the scarlet bell of an *Aeschynanthus*, an epiphytic Gesneriad, flashed like a spark in the gloom of the dense forest. Exquisite pink and white balsams were very common and now and then a handsome ground orchid was seen. A few small palms grew among the tangle of other plants and splendid tree ferns abounded on all sides. Enormous specimens of *Angiopteris*, one of the Marattiaceae, were common, and upon the trees a great variety of epiphytic ferns, *Ophioglossum pendulum*, *Asplenium Nidus*, various Hymenophyllaceae and many others contended with other plants for a foothold. With all these distractions it was not strange that we were a good while in covering the road to the spot where *Treubia* was to be found. But finally we arrived and plunged into a dense thicket, Sapihin plying the wicked-looking big knife which every Malay seems to carry, to cut through the thick sappy stems of the rank vegetation which choked our path. The *Treubia* was growing in thick mats over fallen rotten logs and on the wet ground, its big fleshy fronds a full inch across, and I soon had a fine lot of specimens in my collecting bag. Near by we also found the rare and beautiful *Calobryum Blumei* Nees, which Goebel rediscovered. This upright liverwort, with its large spirally arranged leaves, looks very much more like a big moss than it does like a liverwort, but the long stalked sporogonium is typically hepatic in aspect. Both of these species were collected repeatedly later on, and although

not common are by no means so rare as has generally been assumed.

Of the more conspicuous liverworts abounding in the immediate vicinity of the Garden, the biggest is *Dumortiera trichocephala* (Hook.) Nees, which reaches gigantic dimensions, but on account of its extreme brittleness is almost impossible to remove entire from the ground, to which it clings tenaciously. A curious fact was brought to light in regard to this species by Prof. A. Ernst, of Zürich, who was staying at Buitenzorg when I was there. He found that the receptacles are very commonly hermaphrodite. This is very easily confirmed on examination. Professor Ernst has since published an account of this fact.

Of the thallose Jungermanniales, aside from *Treubia*, several genera, *Pallavicinia*, *Metzgeria*, and *Riccardia*, are common, and the rare *Calycularia radiculosa* Steph. was also found a number of times. The genus *Riccardia* is especially abundant, including some twenty or more species. Some of these are very large, *R. maxima* Schiffn. having a thallus a centimeter or more in breadth, but other species are exceedingly minute, *e. g.*, *R. parvula* Schiffn. Of the twenty-four species of *Riccardia* given in Schiffner's list, all but four are described as new. Whether these will all hold remains to be seen. I have myself found it impossible to distinguish certainly between his *R. maxima* and *R. viridissima*, and it may be that the number of species may not be quite so great as he assumes. The commonest species of *Pallavicinia* is *P. Levieri* Schiffn., and of the two or three species of *Metzgeria* the widespread *M. hamata* Lindb. is the most abundant. Of the very numerous foliose liverworts one of the most striking was a *Schistochila*, which was not at all rare. The curious little *Zoöpsis argentea* Hook. & Taylor was also collected but was not common.

During the month spent at Tjibodas daily excursions into the forest were made, and one expedition lasting several days was made to the summit of the mountain. This was full of interest and many forms were collected which did not occur at the lower levels. Near the waterfall of Tjiburrum, specimens of *Marchantia cataractarum* Schiffn. were found, a species as yet collected

only from this mountain. The monotypic *Wiesnerella javanica* Schiffn., also known only from this immediate neighborhood, grew in large masses. This is a Marchantiaceous form evidently allied to *Dumortiera*, but having air-chambers and stomata like those of the typical Marchantiaceae. Some remarkable hot springs, Tjipanas, occur on the way up, and the hot steam has caused an extraordinary development of vegetation. Where the hot water oozed out of the hillside thick cushions of *Sphagnum* and other mosses and liverworts grew about the springs. Among the liverworts growing here was *Pallavicinia radiculosa* (Sande Lac.) Schiffn., which was some six inches or more in length. A couple of days were spent at Kandang Badak, a saddle between the two cones of the mountain. At this place, which lies at an altitude of about twenty-five hundred meters, a substantial shelter hut has been built and one can camp out very comfortably here for as long as one wishes. At the higher elevations the hepatic flora is not so well developed as further down, but mosses and lichens are more abundant. Some species of liverworts, however, are confined to this higher elevation. Of these alpine Hepaticae, the beautiful *Pallavicinia Zollingeri* Gottsche is the most striking. This is one of the section, *Mittenia*, with creeping rhizomes and upright fan-shaped dichotomously branched laminae looking like little fern leaves. This beautiful hepatic was common from a height of about twenty-two hundred meters up nearly to the summit of Pangerango, the highest of the two peaks. Pangerango is a very perfect extinct cone, and seems to have a heavier rainfall than the neighboring active crater of Gedeh. Another rare liverwort collected on Pangerango was *Fimbriaria Zollingeri* Steph.

On the return to Tjibodas, a very large and conspicuous *Dendroceros* was collected. The occurrence of this genus at such an elevation (about 2,200 meters) was quite unexpected. This probably is an undescribed species, but no authentic specimens of *D. javanicus*, the only species hitherto recorded from Java, were available for comparison. A second, much smaller species was afterward collected at Tjibodas, but which if either of these is the true *D. javanicus* remains to be seen.

While at Tjibodas further search was made for the *Anthoceros* with multiple chromatophores collected near Buitenzorg. This species was not found, but another one was discovered, much larger and not at all uncommon. This grew usually upon rotten logs but afterwards was found also upon the ground and occasionally upon boulders. It is possible that the form growing upon the boulders is distinct. This species was named *Megaceros Tjibodensis* and a full account of it as well as of the other species has been published (Some Javanese Anthocerotaceae. No. I. Annals of Botany, vol. 21. October, 1907).

A brief excursion was also made to Garoet, lying in the mountains to the southeast of Buitenzorg in a much drier district with a correspondingly poorer flora. The liverworts of this region are some of them xerophytic in character, growing upon more or less exposed rocks. At this place I found *Targionia dioica* Schiffn. and a species of *Fimbriaria* occurring in clefts among the lava blocks upon the exposed slopes of the Goentoer, a volcano in the neighborhood of Garoet. The other forms collected appeared to be the same as those found about Buitenzorg.

No account of the collecting in Java would be complete without an acknowledgment of the very great indebtedness of all botanists to the admirable organization of the botanical gardens and the allied Department of Agriculture, which is largely due to the efforts of the distinguished director, Professor Treub. Everything is done to aid the visiting botanist, all the very complete laboratories and libraries being placed freely at his disposal. The opening of the wonderful forest of Tjibodas and the help of the efficient native collectors, whose acquaintance with the native plants is very extensive, make collecting a comparatively simple and expeditious matter, and one is able in a very short time to accumulate a mass of invaluable material, which it would be impossible to duplicate elsewhere.

LELAND STANFORD JUNIOR UNIVERSITY.

THE CHESTNUT CANKER

By William A. Murrill

Nearly two years have elapsed since I gave the readers of Torreya a brief account of the appearance and life history of this serious fungus disease of our native chestnut and characterized the fungus under the name *Diaporthe parasitica.* Since that time the disease has been reported from many additional localities, and numerous inquiries have been made regarding its nature and treatment.

The origin of the disease and the center of its distribution are still entirely unknown, while the area of its distribution is known very imperfectly as yet and can be determined accurately only by careful field explorations conducted by competent persons. The amount of damage done by it, in and about New York city, where it has been most carefully observed, probably reaches a total of between five and ten million dollars. Of the numerous splendid chestnut trees that once existed in the parks, woodlands, and country estates of this region, it would be difficult to find to-day a hundred perfectly healthy trees; dead trees have been cut by the hundreds during the last two years and the rest will undoubtedly meet the same fate.

Field studies indicate that the chestnut canker is spreading rapidly. The summer spores are so minute and are produced so continuously and abundantly throughout the growing season that rapid distribution by the wind and other agencies is to be expected.

Not only the native chestnut, but also the European and Japanese species, frequently planted in this country, and the chinquapin, growing naturally from New Jersey southward, are known to be subject to its attack. If the disease continues as it has begun, there is, theoretically, no reason apparent why it should not sweep from the country practically every tree, both native and cultivated, of the genus *Castanea.* Let us hope, however, that, in the economy of nature, something will intervene to prevent this.

In the meantime, concerted effort should be made to determine the actual spread of the disease and to prevent its introduction into new localities in this country and in Europe through diseased nursery stock. Affected trees are doomed. There is no treatment except pruning away affected parts, and these are rarely discovered in time to save the tree. Pruning always opens up new points of infection, in addition to the pruning wounds, by causing the death of certain areas that are thus deprived of nutriment. Infection by natural means is also liable to take place at any time.

A careful inspection of several hundred infected trees of all sizes recently cut showed conclusively that pruning with a view to saving the tree is futile. Many of these trees had been carefully pruned with this in mind for two or three years, apparently without the slightest effect. The number of separate infections counted, on young trees as well as old, was remarkable, reaching twenty-five or more in some cases. In many cases, where the disease was more advanced, trunks from two to five feet in diameter were found affected throughout their entire extent from top to base, branches included, the fungus showing in the cracks of the bark on all the older portions and in the lenticels of the younger twigs. A year or two later, the bark sloughs off, leaving the wood white and naked and entirely unaffected by the fungus.

Owners of individual affected trees of large size are advised not to attempt to save them, but to prune away affected branches for the sake of appearance only, until the tree ceases to be an ornament. In the case of a few young trees on the home grounds, careful pruning of affected branches might be tried as a preventive, but I can hold out little hope of success.

It need hardly be said that the planting of any species of chestnut at this time in the affected area would be attended with great risk. Owners of chestnut timber should make use of it at once, thus clearing the woodlands of the sources of infection and giving young trees of other kinds an opportunity to develop.

New York Botanical Garden.

REVIEWS

Druce's List of British Plants*

The appearance of this little octavo of 204 pages, containing the names of 734 genera and 2,958 species, besides a very large number of varieties, may be regarded as an important event in the history of English botany. However inconvenient its pursuit by one's self or by others, nomenclature is a department of botany that is of fundamental importance. As a very general rule, those botanists who are indifferent to it are not numbered among either the more careful or the better informed, a fact which, in the nature of the case, could not be otherwise. The study of botany, native and foreign, in England, has suffered through the neglect of this subject, a neglect which has been to a great extent forced upon many who disapprove of it, by the exigencies of official requirement. Oxford is one of the places where such repressive influence is least felt, and it is but natural that the rational revision of British plant names should have been there undertaken. The attitude of Mr. Druce toward this subject was made very clear when he successfully contended for the starting point in priority that has since been almost universally accepted. Pharmaceutical botany felt his influence when he recognized the doctrine of priority, and rejoiced that the principles of Bentley and Trimen were to be by him maintained. His opinions are illustrated by the following extract from the preface to the "List":

"The oldest generic and specific name is chosen where possible, the starting-point being the first edition of the *Species Plantarum* of 1753, a date and work first suggested by the compiler in a paper on nomenclature (*Pharmaceutical Journal*, p. 789, 1892). At that time, the date of the first edition of the *Genera Plantarum*, 1737, was adopted by the committee which framed the Paris 'Leges' as the starting-point of generic citation, and it was only after some considerable correspondence that the writer

* List of British plants, containing the Spermophytes, Pteridophytes and Charads found either as natives or growing in a wild state in Britain, Ireland, or the Channel Isles. By George Claridge Druce, M.A., F.L.S., Secretary of the Botanical Exchange Club and Fielding Curator in the University of Oxford. Clarendon Press, 1908.

induced M. Alphonse de Candolle to support his view that generic and specific citation should both date from 1753. Independently, Professor Ascherson and other Berlin botanists pressed for the same object, and that date is now generally accepted, and was adopted in one of the 'Actes' passed at the Vienna Congress of 1905.

"But at that Congress, unfortunately, several genera were made into a favoured list of 'Nomina Conservanda,' despite the fact that others, avowedly of a prior date, existed. Space does not allow the matter to be laboured here, but it must be said that this list is either unnecessary or insufficient; for instance, the well-defined and definite genus *Mariana* Hill is put among the names which are to be rejected, while *Radicula* Hill (a faulty name, and a badly defined genus, excluding as it does the Water-Cress, which may be looked on as the type of the genus, and including the yellow-flowered species only) may be used. This and other inconsistencies must in the long-run outrage the sense of justice, which after all is a key-note of botanical as well as human laws. Therefore the 'Nomina Conservanda' of the Vienna Congress are here deliberately ignored when other generic names which appear to be properly diagnosed have priority. An important section of Transatlantic botanists take the same course, and in the *Bulletin of the Torrey Botanical Club*, April, 1907 * (which appeared after this *List* was prepared), state that 'they regard [the exclusion of several hundred generic names of plants from the operation of all nomenclatorial rules] as in the highest degree arbitrary, as controverting a cardinal principle.' This is not only common sense, but practical and just. A plan which accepts *Phyllitis* Hill and conserves *Silybum* Gaertn., 1791, in preference to *Mariana* Hill, 1762, or which retains an inchoate pseudo-homonymous genus like *Epipactis* of Adanson or Crantz, or the faulty *Gloriosa* L., but rejects *Capnoides* Adans., which was founded by Tournefort, and the identity of which is undoubted, fails to inspire confidence, and certainly does not commend itself on the ground either of justice or consistency. In many cases there must be diversity of opinion, and exception may quite fairly be taken to some of the names here employed, but an endeavour has been made to carry out consistently the principles of priority."

By ignoring the foolish and crude list, forced by the Berlin

* The canons framed by the botanists at the meeting in Philadelphia in March, 1904, which are reprinted in the *Bulletin*, l. c., have much to commend them for their practical common sense.

botanists upon the Vienna Congress, and standing out for priority, Mr. Druce's results come very close to those reached by adhering to the theory of types, to which theory we again invite attention, believing that a position must be reached in which genera will stand or fall with their type species. If no type was assigned by the author of the genus, one must be assigned by some combination of considerations. For North American genera, types are rapidly being established by one author or another, and it is to be hoped that European genera will also become fixed by this method. Descriptions of genera without any species assigned them will not stand against genera with designated types.

A system which retains *Posoqueria* Aublet, 1775, but rejects *Icacorea* Aublet, 1775, both published as monotypic in the same work, and which retains *Piscidia* L., 1759, while rejecting *Ichthyomethia* P. Browne, 1756, both based on the same type, is bound by its very absurdity to fail. We think that the Berlin botanists, by proposing this highly arbitrary means of attempting to steady the use of generic names, failed to take advantage of a great opportunity, which they were not ingenious enough to see.

The manner in which Mr. Druce has performed the present piece of work is highly creditable. By a carefully elaborated system of symbols and typography, his list tells us whether a given plant is native or doubtfully so, whether of fugitive or occasional occurrence, or established, if it has become extinct, if found only in the country cited, and other facts regarding distribution, if a probable hybrid, and if so, which is its dominant parent. The author states that during thirty years' collecting, he has seen all but fifty of the plants listed growing *in situ*. Synonyms are given only when this is necessary for some special reason. Specific names are capitalized when of previous generic significance, when personal or when terminating in *oides*, "this being evidently the intention of Linnaeus." The ending *aceae* is retained for family names. Since the list is to be used largely as a check-list, for exchange purposes, all specific names are consecutively numbered. The parenthetical citation of authors is employed in cases of generic and varietal, but not for specific names.

The author's strong — we think too strong — tendency to unite genera is indicated in his inclusion of both *Pulsatilla* and *Hepatica* in *Anemone*, and *Batrachium* in *Ranunculus*.

Mr. Druce's list, by excluding, in deference to the Vienna Rules, duplicate binomials, fails to record important nomenclatorial facts, just as it does in omitting parenthetical citations of authors of specific names. In the latter case, indeed, the omission actually involves misstatement. That such loss, if noted, is accepted by the author out of sheer dislike for unfamiliar mechanical form would seem to be indicated by his treatment of other names which, for every reason except such form, have less to commend them than the double names referred to.

He admits the name *Cerastium cerastioides* Britton, an inane binomial, made necessary by the priority of the specific name of the plant described by Linnaeus as *Stellaria cerastioides*. We do not understand why, as he accepts this meaningless name, he should decline to accept names like *Mariana Mariana* Hill, or *Coronopus Coronopus* Karsten, which are not meaningless, but very significant, indicating as they do, that *Carduus Mariana* L. is the type species of *Mariana* and that *Lepidium Coronopus* L. is the type species of *Coronopus*. These duplicate names were rejected at Vienna by a close vote, taken after Professor Engler had made the naïve complaint that some of his students laughed at them! There is plenty of good precedent for their retention, both botanical and zoölogical.

The list prepared by Mr. Druce will be of great value, not alone to the members of the British local clubs and societies to whose membership it is primarily addressed, but to students in America and in Continental Europe. In Great Britain it cannot fail to mold opinion and to fix the usage of many plant names for a long period. Emanating as it does from Oxford University, it is assured a distinguished and independent audience; we congratulate Mr. Druce on its appearance!

H. H. Rusby,
N. L. Britton.

PROCEEDINGS OF THE CLUB

March 25, 1908

The meeting was held at the museum of the New York Botanical Garden, with Dr. John Hendley Barnhart in the chair. The minutes of the meetings of February 26 and March 10 were read and approved. A special committee of the Club appointed on February 11 reported as follows:

At a regular meeting of the Torrey Botanical Club held at the American Museum of Natural History, February 11, 1908, a committee was appointed to draft resolutions concerning the death of the late Morris K. Jesup.

Be it therefore resolved, that the Secretary be instructed to enter in the proceedings of the Torrey Botanical Club, and transmit to the Board of Trustees of the American Museum of Natural History, this record of our sincere regret at the loss of one who always manifested such a broad and deep interest in all matters pertaining to natural science.

The report of this special committee was unanimously accepted and adopted. The scientific program was then taken up and two papers were read, of which the following abstracts have been furnished by the authors:

"Botanical Experiences in western South Carolina," by Mr. Homer D. House.

The richness of the flora of the southern Alleghany mountains was commented upón, special attention being directed to the beauty of the mountains in early June, when several species of *Azalea* and *Rhododendron* are in bloom. Two trips into the mountains were described, one to Jocassee Valley for *Sherwoodia* (commonly known as *Shortia*) and to Tomassee Knob and Tomassee Falls. At the latter place several northern plants were collected, among others *Viola canadensis*, *Trillium grandiflorum*, *Filix bulbifera*, and *Dryopteris Goldiana*. The second trip was to Rabun Bald in Georgia during early June. The top of this mountain is covered with *Rhododendron catawbiense*, which was at that time in full bloom. In the thickets around the coves on the eastern slope of the mountain a new species of

bindweed, *Convolvulus sericatus*, was found. *Viola rotundifolia* also was found here, as well as in adjacent South Carolina, thus considerably extending its known range. The speaker exhibited a large number of specimens, several of them new to South Carolina, and commented upon their distribution.

"Observations on the Nutrition of *Sarracenia*," by Winifred J. Robinson.

Plants of *Sarracenia purpurea*, the common northern pitcher-plant, were exhibited and several colored illustrations of the plant in flower were shown.

The present series of experiments was undertaken under the direction of Professor William J. Gies, at the New York Botanical Garden in the summer and autumn of 1907, to determine the digestive power of *Sarracenia purpurea*, on carbohydrates, fats, and proteins. Solutions of great difference in concentration were introduced into the pitchers and it was found that they resisted distilled water and 33⅓ per cent. sugar solution equally well. Acid and alkaline solutions of a very low concentration had no apparent effect upon the pitchers, but a 0.5 per cent. solution of acetic acid and a 1 per cent. solution of potassium nitrate both proved injurious. Sachs's nutrient solution caused the pitchers to decay within a few days. Liebig's meat-extract was used as a test of the effect of a stimulant. Bacteria and infusoria developed in great numbers and decay began in a few days. Solutions of milk in distilled water of different proportions were used, from the results of which it was inferred that the pitcher produced an alkaline substance which reacted with the acid produced in a very dilute solution of milk, but was not sufficient to neutralize solutions of greater strength. There was nothing to indicate that the milk fat or protein was digested. Solutions of grape-sugar and cane-sugar of different proportions were placed in the pitchers and there were no indications of a detrimental effect upon them. With Fehling's solution, the contents of the pitcher, after the sugar solution had been allowed to remain in them several days, gave a reddish precipitate of copper oxide, indicating the presence of invert sugar. The reduction was most marked in a 10 per cent. solution of cane-sugar.

Starch paste was allowed to remain in the pitchers from three to seven days, when it was removed and tested by boiling with Fehling's solution The reddish precipitate indicated that a reduction had taken place, though it was not so marked as in the case of the cane-sugar. The addition of an antiseptic did not hinder the reduction of the cane-sugar or starch. Olive-oil and ethyl butyrate were used to test the fat-digesting power of *Sarracenia*, but the results indicated no digestion. Fibrin was used to determine the digestive power upon protein, but the results were negative. These results as to protein correspond with those obtained by Schimper in 1882 (Bot. Zeit. **40**: 225) and by Goebel in 1893 (Pflanz. Biol. Schild. **2**: 186).

MARSHALL A. HOWE,
Secretary pro tem

APRIL 14, 1908

The Club was called to order at 8:30 o'clock by Vice-President, John Hendley Barnhart. Seven persons were present.

After the reading and approval of the minutes of the preceding meeting, the name of Mrs. M. H. Reed, 185 Audubon Avenue, New York City, was presented for membership.

The report of the Committee, appointed at the meeting of January 14, 1908, to audit the books and accounts of the Treasurer of the Club for the year 1907, was read and approved.

Resignations were read and accepted from Mr. C. M. Bergstresser and Mr. O. M. Oleson. The Secretary was directed to cast the ballot of the Club electing Mrs. M. H. Reed to membership.

The scientific program consisted of two papers as follows:

"The Relation of Chemical Stimulation to Nitrogen Fixation *Sterigmatocystis*," by Marion E. Latham.

This paper will appear in full in a future number of the "Bulletin" of the Club.

"Some Forms of Protoplasmic reaction," by H. M. Richards.

The speaker reviewed the more recent literature and theories bearing on the subject of the stimulus and response of protoplasm.

Both of these papers were followed by an interesting discussion, and the meeting adjourned at 10 o'clock.

C. Stuart Gager,
Secretary.

OF INTEREST TO TEACHERS

Notes on Experiments in Plant Respiration

Jane R. Condit

The experiment designed to show that plants give off carbon dioxide rarely gives satisfactory results with the simple apparatus that can be handled by high school pupils. The withdrawal of the air under water is too complicated for pupils of this age. Contrasting results are not always secured by placing small dishes of lime-water under bell jars with and without growing plants because of the proportionately large amount of air from the room enclosed in each.

In the following experiments in plant respiration a simple method of obtaining samples of air for the carbon dioxide test is given ; and contrasting results are certain because of the small but equal amount of air in the check bottle.

A small jar was one-fourth filled with damp germinating barley and placed in the dark. When a lighted match was placed in the jar two days later the flame was extinguished at once, showing that the barley had used so much of the oxygen in the jar that there was not enough left to support combustion. A match placed in a similar check jar without the barley continued to burn for some time.

A small wide-mouthed bottle was filled with the gas from the barley jar by first filling it with water and then inverting it in the jar. When fresh lime-water was added to the gaseous contents of the bottle, a heavy white precipitate appeared. A similar check bottle full of ordinary air did not show this precipitate when the lime-water was added. This showed that carbon dioxide must have been given off by the germinating seeds.

The jar was again sealed, placed in the sun light and left for a week. When the leaves had become green the gas in the jar

was then tested with a lighted match. This time the light was not extinguished, showing that the green leaves had given off oxygen.

Teachers College.

A Simple Modification of the Experiment to Show the Gaseous Exchange in Plant Respiration

By C. Stuart Gager

In the experiment to teach the gaseous exchange accompanying the respiration of various plant organs it is essential to show two facts: first, that the oxygen has been absorbed, and, second, that carbon dioxide has been given off. The very common practice of partially filling glass jars with the tissues to be investigated is unsatisfactory in several ways. It is not always easy to lower the lighted taper as far down into the jar as is desirable, and, furthermore, when the lime-water test is applied it is either necessary to remove a sample of the air from the jar, or else pour the lime-water into the jar. The first operation is not easy, and only invites failure. By the second method the lime-water is liable to become so dirty from contact with the plant material, or so obscured by it, that its change to a milky color must be taken largely on faith.

The simple device, shown in the acompanying illustration, does away almost entirely with the above annoyances. A partition of wire netting divides the jar vertically, and leaves a space to one side into which the burning taper may be inserted as far down the jar as necessary. The wire netting should be of somewhat smaller mesh than that shown in the photograph, and should fit snugly into the jar so that the latter may be tipped over slightly. The lime-water may then be poured in at the side opposite the plant-material, and (after the stopper is tightly replaced) shaken well up and down the jar to insure thorough contact with the carbon dioxide. By this means the lime-water is not clouded with dirt from the plants. After the netting has been once prepared it requires practically no more time to set up the experiment than without the netting, while the operations that must be

Apparatus for demonstrating the gaseous exchange in plant-respiration.

performed in the presence of the class are not only smaller in number, but much simpler than when a sample of the air must be removed to be tested.

In the illustration the six jars, besides the empty one, contain, respectively, green leaves, roots, stems, variously colored flowers, germinating seeds, and some kind of fleshy fungus.

New York Botanical Garden.

NEWS ITEMS

Professor H. A. Winkenwerden of the U. S. Bureau of Forestry, is to succeed Professor J. F. Baker as professor of forestry at the Colorado School of Forestry.

Mr. R. H. Biffen, whose researches on the hybridization of wheat and barley have attracted much attention, has been elected to the recently established chair of agricultural botany at Cambridge University.

The Graduate School of Agriculture will hold its third session at Ithaca and Geneva, beginning July 6, 1908, and continuing for a month. The botanical subjects included are Agronomy and Horticulture.

The Marine Biological Laboratory will hold its twenty-first session at Woods Hole, from June 1 to October 1, 1908. The work will include embryology and botany, the latter being under the direction of Dr. George T. Moore.

There is to be held from September 14 to 26 of this year in Olympia Hall, London, England, an International Rubber and Allied Trades Exhibition. Professor Francis E. Lloyd, a member of the Torrey Club, is one of the Mexican Committee, of which Dr. Pehr Olsson-Seffer is Chairman.

The nineteenth annual session of the Biological Laboratory of the Brooklyn Institute of Arts and Sciences will be held at Cold Spring Harbor for six weeks, beginning Wednesday, July 1. The laboratory is also open for investigators during the entire summer. The courses offered include cryptogamic botany, plant ecology, and beginning research in botany.

The Naples Table Association for Promoting Laboratory Research by Women announces the offer of a fourth prize of one thousand dollars for the best thesis written by a woman, on a scientific subject, embodying new observations and new conclusions based on an independent laboratory research in biological, chemical or physical science. The theses must be presented before February 25, 1909. For further information address Mrs. E. H. Richards, Massachusetts Institute of Technology, Boston.

New Zealand with over a million acres of native forest land estimated to last seventy years, has reorganized the forestry movement dropped some years ago because of its cost. It is an attempt to remedy what is now conceded to be a serious mistake and nurseries and plantations are being extended rapidly. Trees from the United States, Europe, and Australia are being systematically introduced, as the native trees of New Zealand are very slow in growth. Some of the largest trees which produce excellent timber need two hundred or more years to complete their growth.

Attention is called to the botanical excursion planned by the University of Washington for the summer of 1909, under the direction of Dr. T. C. Frye, of the department of botany. The general plan is to leave Seattle about July 1, and go as far north as Skagway. From the chief cities as a base excursions will be made into the mountains, to glaciers, to mines and along the seashore. The work, which will include lectures on plant ecology and opportunities for collecting material, will close in Alaska six weeks from date of sailing from Seattle. The expense will be \$20 incidental fee, about \$70 steamer fare, and the living expenses which are estimated at \$80 for the six weeks, making a total of about \$175 from Seattle.

TORREYA

Vol. 8. June, 1908 No. 6.

BOTANY.*

By Herbert Maule Richards.

So much then for the purely theoretical side of botanical research of which I have presented a hasty glimpse. It is necessary before closing to make some reference to the utilitarian aspect; where and how botany directly serves the material needs of man. I hold it myself to be a matter of some pride that a science like botany with a side so purely theoretical and impractical can also lend itself to further, in such important ways as it does, the well-being of mankind, for in the direct application of botanical information to agricultural questions the ways and means of life may be ameliorated. Moreover, it is some of the most theoretical and recondite researches which have led to the most important practical results.

It is possible to consider only a few phases of the practical application of botany, and I will choose those which are not commonly recognized, and which require a high degree of special botanical training. The necessity of botanical knowledge in the use of plants and their products in the arts, or as drugs, is easily understood without further reference, and such uses do not necessarily involve any broad knowledge of plants as a whole.

It is quite different, however, in the matter of plant pathology, for here every channel of botanical information must be used to investigate plant ailments. Bacteria and parasitic fungi, which are themselves plants of a low order, are the cause of the bulk of plant diseases and for that reason the study of their life his-

* A lecture delivered at Columbia University in the Series of Science, Philosophy, and Art, December 4, 1907, copyrighted and published by the Columbia University Press, February, 1908, and reprinted by permission in Torreya, beginning with the March number.

[No. 5, Vol. 8, of Torreya, comprising pages 93-124, was issued May 19, 1908.

tories becomes a matter of no small importance. Then, too, the structure and habits of the host plants must be taken into consideration, for upon these may depend the means of prevention or of cure. The assembling of this information and its practical application to the question in hand devolve upon that type of botanist usually referred to as the mycologist, and despite many failures much that is of substantial practical use has been established. One of the earliest, if not the earliest, recorded instances of where a community has taken formal notice of the fungus pests of plants is found in the old Barberry Law passed by the province of Massachusetts before the Revolution. This called for the extirpation of the barberry which had been noticed by the colonists, without any knowledge on their part of the real cause, to be connected with the rust of their wheat fields. To-day we may not pass laws for the destruction of diseased plants, realizing perhaps the hopelessness of enforcing them, but we combat plant disease by the establishment of experiment stations devoted to the investigation of such matters.

As a result, there is now at the disposal of the agriculturalist much definite information of ways and means of diminishing or preventing loss through the destruction of crops by disease, losses which statistics show may amount to tens of millions annually; and while the study of the action of bacteria and fungi in the disease of plants is by no means complete, no one can deny the practical results which have been attained. In the more indefinite functional diseases of plants not ascribable to definite parasites, there is room for much more information, which will be forthcoming when our knowledge of nutrition physiology is more full. Already, however, we have suggestions as to the cause of the functional diseases which often appear where the same crop has been raised for many years in succession in the same spot, which bid fair to explain some important plant ailments that are at present not understood.

A more popularly interesting line of activity that has a practical bearing is found in plant breeding, which has recently been attracting wide attention. Plants are now bred systematically for desired characters, not always for increased yield only, but

also for such qualities as resistance to extremes of temperature, to lack of moisture in dry or semi-arid regions, to resistance towards specific diseases, and even for the more esthetic qualities of flavor or color. The old hit or miss methods of the improvement of strains by empirical rules of selection is passing away, and more and more scientific methods, based on the latest results of investigations of heredity and variation, are being employed. Passing over the older methods I will take up two very different types of plant breeding, both modern: one the strictly scientific, the other the intuitive.

The first method we owe largely to Nilsson, who introduced it at an experiment station in Sweden in connection with the cultivation of various cereal crops. It may be said that previous to his advent the older methods had been tried and abandoned as a failure. With his knowledge of what had been published about heredity and variation, Nilsson, after some preliminary experiments, arrived at the conclusion that no new, pure, or constant strains of wheat could be obtained unless the fruit of a single ear was bred separately, and thus he established what is known as the principle of breeding from the single ear and not from assorted lots of seed taken from many individuals. This breeding he continued, picking out any chance favorable ear which he could find, until he obtained many thousands of different forms owing to this multiplicity of strains mixed in the ordinary wheat. Of course some turned out to be mere bastard strains and only the ones which continued to breed true to character were kept. These constituted the new agricultural varieties — in reality elementary species and mutants — which, after severe tests had proved them suitable, were raised in marketable quantity for seed. The amount of work involved was enormous, the mere bookkeeping of the accurate pedigree record with notes on the life history of each form and its progeny was in itself no small matter. Besides the principle of single-ear breeding, Nilsson also established the fact that but a single selection alone is necessary to fix a new strain, provided the progeny of the chosen ear are carefully guarded from admixture with other forms. All this seems absurdly simple, and it is simple, so much so that it is quite possible of application by a

person of average intelligence who has had the proper instruction; but the important point is that it was discovered by the application of thoroughly scientific methods. Nilsson's principle is in very general application to-day and is being used to excellent effect in the improvement of Indian corn in the middle West.

Contrast with this the methods of Mr. Burbank, whose name is familiar to all. It is not that he should not be given the credit of having established new and useful strains of cultivated plants, or of having done some remarkable feats in the way of plant breeding; but it is that his methods are almost purely intuitive and would die with him, were his own records all that there was to be left behind, a striking difference from the mass of data accumulated by Nilsson. It is the rule of thumb method, picturesque but uncertain, as against the surer but less romantic practices of science.

The matter of general scientific agriculture opens an immense field in which I can call your attention to a few points only. The scientific care of our forests, for trees may be regarded as a crop and their culture agriculture, is a question to which we in this country are awakening none too soon. Forestry as practised in Europe, demanding as it does expert botanical knowledge, perhaps not by the foresters themselves but by those who direct their labors, has saved what were the fast diminishing wooded areas. There is need of haste with us for similar scientific treatment of the problem by men who are not simply woodsmen, but botanists as well.

The scientific rotation of crops, the use of fertilizers, and the study of the physical and chemical condition of the soil in connection with the living plants, involve questions which may mean the success or failure of much of our farming. These questions can only be settled by careful investigations which take into consideration the nature of the plants themselves as well as the physical conditions of their environment. Some may say that knowledge along this line has been satisfactorily handed down from father to son, that the farmer knows his business better than does the scientist, but it is a patent fact that this is not so. For instance, many a farm which has been damaged for a long period of years by the over-liming of the soil might have been spared had

the farmer of fifty years ago had the knowledge, which we now have, of the relation of lime to the other mineral substances needed by the plant, of when to apply it, and when to withhold it. It is the difference between merely empirical knowledge and that which is based on scientific principles.

When the contest comes between virgin soil and long tilled land, the latter, no matter how rich it may once have been, must needs be cultivated more intensively if it is to hold its own. Intensive cultivation requires the aid of special information and it is here that scientific agriculture comes into play. Few people realize that without artificial fertilizers, the direct outcome of highly theoretical work on the raw food stuffs of plants, much of the farming of to-day would be almost impossible. And the proper use of fertilizers is but one of many questions.

We are coming now in this country to a stage in its development when scientific agriculture must be seriously considered. Fortunately it is being so considered and the federal and state establishments devoted to the investigation of these agricultural questions may confidently be expected, I think, to help in the solving of the practical economic questions that must arise in the competition of our own agriculture with that of other lands. The way it must be done is by the introduction of improved methods based on carefully conducted scientific research, that often find their stimulus in the highly theoretical investigations of the pure scientist. Thus must the so-called impractical devotee of science come in contact with the practical man of affairs and furnish him knowledge that can be used for the benefit of all.

In this somewhat categorical fashion then, I have endeavored to present to you some of the content of the science of botany; that science which consists of the dismembering of flowers and the giving to them of long names. What its future will be is perhaps already indicated, but briefly you can see that it is in the direction of physiological advance, away from pure taxonomy and formal morphological conceptions towards the realm of function; away, too, from any segregation of the science from kindred fields towards a better understanding of the place of plants in the whole cosmic scheme.

Man's attitude towards the unknown — his philosophy in short — must influence his attitude towards botany as it will towards any science; and since philosophy, like other lines of intellectual activity, changes and progresses, man's attitude towards science is not a fixed or rigid one. But it is not likely that philosophy will ever tend to discourage investigation, and investigation is the keynote of scientific progress. Unquestionably, the world demands research, and any fact no matter how humble, if accurately established, helps on the cause. Perhaps the time will come when our knowledge of to-day will seem as crude as that of yesterday now seems to us. Let not that concern us, except to urge us to do what we may in hastening this time, knowing that that is where real progress lies, and knowing too that there is ample work that can and must be done.

A KEY TO THE WHITE AND BRIGHT-COLORED SESSILE POLYPOREAE OF TEMPERATE NORTH AMERICA—III*

By William A. Murrill

K. The Species of Coriolus

1. Tubes more or less entire, at least until the sporophore is quite old. 2
   Tubes soon breaking up into long irpiciform teeth. 19
2. Surface of pileus wholly or partly glabrous when mature or clothed only with inconspicuous hairs. 3
   Surface of pileus clothed entirely with a conspicuous, hairy covering. 17
3. Pileus not entirely glabrous at maturity. 4
   Pileus entirely glabrous at maturity. 13
4. Pileus marked at maturity with glabrous zones of a different color from the rest of the surface. 5
   Pileus not marked with glabrous zones, but nearly uniform in color and rarely shining. 10
5. Glabrous zones large, numerous, conspicuously and variously colored. *C. versicolor* (L.) Quél.
   Glabrous zones small and comparatively inconspicuous. 6
6. Surface villose between the zones, which are late in appearing; plants small, 1–2 cm. in diameter. *C. hirsutulus* (Schw.) Murrill

* This concludes the series of keys to the pileate species of polypores found in temperate North America. The resupinate species are more difficult, most of them requiring the facilities of a well-equipped herbarium, as well as considerable experience, for their proper determination.

Surface minutely pubescent or tomentose between the zones; plants usually much larger. 7

7. Hymenium white or yellowish. 8

Hymenium umbrinous or fuscous. 9

8. Tubes small, 5 to a mm., perfectly regular and entire. *C. ectypus* (B. & C.) Pat.

Tubes twice as large, often irregular from splitting; glabrous zones late in appearing and sometimes absent. *C. pubescens* (Schum.) Murrill

9. Hymenium umbrinous; surface opaque, with very few zones. *C. alabamensis* Murrill

Hymenium fuscous; surface shining, multizonate. *C. sector* (Ehrenb.) Pat.

10. Sporophore semiresupinate, narrowly reflexed. 11

Sporophore normally pileate, sometimes decurrent. 12

11. Tubes 1 cm. or more in length. *C. subluteus* (E. & E.) Murrill

Tubes only a few millimeters long, hexagonal, 1 mm. broad. *C. hexagoniformis* Murrill

12. Margin broadly sterile, the sterile zone about 2 mm. broad. *C. limitatus* (B. & C.) Murrill

Margin fertile or narrowly sterile. *C. balsameus* (Peck) Murrill

13. Surface brown or blackish. *C. planellus* Murrill

Surface white to isabelline. 14

14. Margin of pileus very thin, becoming fimbriate or lacerate at maturity. *C. Drummondii* (Kl.) Pat.

Margin of pileus not as above. 15

15. Surface rough, scabrous; pileus rather small, usually cuneate. *C. Lloydii* Murrill

Surface perfectly smooth between the zones; pileus fan-shaped. 16

16. Surface white to ochraceous, the zones deeper yellow. *C. ochrotinctellus* Murrill

Surface isabelline with pale-latericeous zones. *C. concentricus* Murrill

17. Pileus 5 mm. or more thick, tubes small and regular. 18

Pileus much thinner, tubes large and irregular. *C. sericeohirsutus* (Kl.) Murrill

18. Surface roughly hirsute. *C. nigromarginatus* (Schw.) Murrill

Surface finely hirtose-tomentose. *C. subchartaceus* Murrill

19. Pileus large, 5–10 cm. broad, 5–10 mm. thick, fibrillose-tomentose to subglabrous; confined to deciduous wood. *C. biformis* (Kl.) Murrill

Pileus smaller and much thinner. 20

20. Surface ashy-white, villose, confined to coniferous wood. *C. abietinus* (Dicks.) Quél.

Surface wood-colored, finely tomentose; usually found on deciduous wood. *C. prolificans* (Fr.) Murrill

L. The Species of Coriolellus

1. Pileus white or pale-isabelline. 2

Pileus cinereous-fuscous, glabrous. *C. Sequoiae* (Copeland) Murrill

Pileus fulvous to latericeous, finely tomentose to minutely strigose. *C. serialis* (Fr.) Murrill

2. Surface conspicuously villose to strigose; context very soft and spongy. *C. cuneatus* Murrill

Surface finely tomentose to glabrous; context firm. *C. Sepium* (Berk.) Murrill

M. The Species of Aurantiporellus

Pileus soft, effused, orange-colored, 1–4 cm. thick.
A. alboluteus (E. & E.) Murrill

N. The Species of Pycnoporellus

Pileus thin, dimidiate, orange-colored, friable when dry.
P. fibrillosus (Karst.) Murrill

O. The Species of Pycnoporus

1. Pileus thick, smooth, opaque. *P. cinnabarinus* (Jacq.) Karst.
   Pileus thin, often zonate, brilliant-red. *P. sanguineus* (L.) Murrill

P. The Species of Aurantiporus

Pileus ochraceous or reddish-orange, tubes orange when fresh, becoming dark and resinous on drying. *A. Pilotae* (Schw.) Murrill

Q. The Species of Laetiporus

Pileus large, yellow throughout, fragile when dry. *L. speciosus* (Batt.) Murrill

New York Botanical Garden.

TERATOLOGICAL NOTES

By C. Stuart Gager

The following instances of structural abnormalities are not presented as contributions. Most of them have been reported before, and some of them often, either in the species here recorded, or in allied species. In complying with a request from the editor of Torreya for an article on teratological observations, it was thought that those given below would be of popular interest, and it is hoped that the paper may stimulate further observations, especially on the part of amateur botanists.

Polycotyly and Syncotyly in Onagra biennis. — Seedlings of dicotyledonous species having three cotyledons are of frequent occurrence, and in "Die Mutationstheorie," de Vries describes such seedlings for *Oenothera Lamarckiana*, *O. laevifolia*, *O. lata*, and *O. rubrinervis*. In experimental pedigreed cultures he found the anomaly hereditary in less than three per cent. of the offspring of plants that possessed it. Fusion of the two cotyledons into one was figured by de Vries for *O. glauca*, and, in crossing half and middle races ("Die Mutationtheorie" **2** : 345), this was

found to be a Mendelian character. I have found an instance of both tricotyly and syncotyly this spring in pedigreed cultures of *O. biennis*.

Fusion of Capsules in Onagra biennis. — In "Die Mutationstheorie" de Vries (*l. c.* **2**: 349–350) has called attention to cases of the occurrence of two flowers in the axil of one leaf in *Oenothera Lamarckiana*. Both flowers produced capsules with seeds and de Vries suggests that the anomaly is due to the development of a supernumerary flower in the axil of an undeveloped supernumerary leaf. Among pedigreed cultures of *O. biennis*, I observed one instance, in the fall of 1907, of two capsules, one very slightly above the other, fused or grafted together throughout their entire length. Each capsule was in the axil of a separate bract, as pictured in figure *e*, and both contained maturing seeds.

A Twin Apple. — Twin fruits of the apple, pear, strawberry, plum, cucumber, and many other species are, as is well known, not at all uncommon. Much literature on this point is cited by Moquin-Tandon, Masters, and Penzig. In the Gardener's Chronicle for 1855 (p. 692), there is figured a twin apple caused by two flowers being "accidently brought into close contact in the earliest state of the bud, being kept firmly in contact as they advanced in growth," and ending "by becoming half incorporated." In the same magazine, in 1879 (**46**: 767), the same sport is again noted, and is said to be not uncommon in the Cluster Golden Pippin, and frequent in the Bedfordshire Twin. Also in the same publication (**54**: 564. 1883) is recorded a case of triplet apples, three "fused together into one mass at the base." Sometimes there are two peduncles, one for each half of the twin, and an instance has been recorded in which one of the peduncles has become broken off from the branch, so that the nourishment of the fruit attached to it had to be derived entirely from the apple with which it was fused. Masters (Vegetable Teratology, p. 20) figures an example of the adhesion of two apples, and, on page 327, a case of interrupted growth, where the peduncle above the normally formed fruit has filled out, and formed a much smaller fruit above the first. In the specimen illustrated in the accompanying figure, and probably a variety of the russet, the peduncle

bears a fringed ridge lengthwise along one side, indicating that it was formed by the fusion of two adjacent peduncles. The specimen shown in figure *k* was presented to the writer by Professor Underwood in the autumn of 1907.

Twin and Triplet Hickory Nuts. — Monstrosities in the hickory are relatively rare. An embryo of *Hicoria ovata* (*Carya alba* Nutt.) with three cotyledons has been described by Dr. N. L. Britton (Bull. Torrey Club **7**: 21. Feb. 1880) and by H. C. B[eardsley] (*ibid.* **7**: 54. May 1880). Dr. Britton has also described a tree of *Hicoria glabra* (*Carya porcina* Nutt.) where most of the leaves, normally pinnately compound, were simple (*ibid.* **8**: 132. 1881). Dr. Arthur Hollick exhibited before the Torrey Club in 1881 (*ibid.* **8**: 60) a distorted fruit of *Hicoria glabra* (*Carya porcina*) which he described as occurring year after year near Court House Station, on the Staten Island Railroad. Only two or three other monstrosities are noted in this genus by Penzig. In 1886 Dr. Hollick (Proc. Nat. Sci. Assoc., Staten Island **1**: 35) exhibited and described twins and triplets of *Hicoria alba* (*Carya tomentosa*). "The twins," he says, "were generally perfectly joined, but the triplets were separate, with the sides flattened where they pressed against each other, similar to chestnuts in a bur. All the nuts from the same tree were more or less affected." Such a variation as this is well shown in figure *l*, and I think no illustration of it has been published before. The specimens (*Hicoria alba*) were collected by Mr. Percy Wilson in 1901, near the N. Y., N. H. & H. R. R. station at Baychester, New York. Dr. Hollick's description is sufficient for these specimens.

Ascidia in Clover. — The formation of pitchers in clover is so common that the instance here figured (fig. *f*.) is referred to primarily because it was stated by the pupil who collected the specimens that every leaf of the plant which bore them possessed ascidia. I did not have the opportunity to observe the plant personally. In "Die Mutationstheorie" (**1**: 641), it is stated that *Trifolium repens* in the garden forms ascidia only in spring, the pitchers preponderating on the first leaves of the shoot. Mulder (Tidjschr. Natuur.-Gesch. en Physiol. **6**: 109. 1839) describes and fig-

ures (Pl. V, f. 1) leaves of *Trifolium repens*, in one of which the middle leaflet is small and dwarfed ; in a second this leaflet is modified as an awn ; while in a third it appears as a stalked ascidium, very similar to the one here figured. Two other points are of interest in connection with the instance here figured. First, the character of the almost sessile pitcher in the leaf that has two, where the margins adhere only at their distal portions. Second, the fact that the ascidia are supernumerary leaflets. If they were removed the leaf would still possess the number of parts normal for the species (*T. repens ?*).

Ascidia in Licorice. — So far as I have been able to find, pitcher-formation has not been previously recorded for the licorice (*Glycyrrhiza glabra*). By inspection of figure *g* it is seen that one leaflet of the fourth pair from the base is a shallow ascidium.

Fasciation in the Honey-locust. — In his " Éléments de Tératologie Végétale" (Paris, 1841, p. 149) Moquin-Tandon, speaking of fasciation in woody dicotyledons, includes the *fevier*, or *Gleditschia* in his list. According to Penzig (Pflanzen-Teratologie, p. 407), Camus recorded fasciation in the variety *inermis* (Anomalie e varieta nella Flora del Modenese. Terza contribuzione Rendiconti della Soc. dei Naturalisti dei Modena. Ser. III, 3. 1886). I have never seen this fasciation figured before. The specimen shown in figure *h* was brought to me by Miss Jean Broadhurst.

Tricarpellate English Walnuts. — Multiplication of the number of parts in the flower is of very common occurrence. Moquin-Tandon (*l. c.*, p. 354), however, called attention to the fact that polyphylly of the gynoecium is more rare than suppression of the organs, on account of the pressure of adjacent parts. Masters (*l. c.*, p. 363) adds that the later development of the carpels is also a factor here. He gives a list of eighty-nine genera in which supernumerary carpels have been observed, and states that the phenomenon is most common in Cruciferae, Umbelliferae, and Liliaceae. Among some English walnuts (*Juglans regia*) recently purchased at a store, two or three nuts were found to have three carpels (see figure *l*) instead of the usual two. While such a thing is common in plants, *Juglans regia* is not included in the

list given by Masters, and I have not seen such a case reported for that species.

A Two-headed Daisy. — The doubling, and even the tripling of the heads in the ox-eyed daisy (*Chrysanthemum Leucanthemum*) and in the dandelion (*Taraxicum Taraxicum*), and other Compositae and Chicoraceae has been often recorded. It is thought, however, that the instances here figured will be of sufficient "popular" interest to justify their mention in TORREYA. The specimens were sent me by Professor Margaret C. Ferguson, of Wellesley, and clearly show three types of the double head. In figure *a* the two heads are quite distinct on the common stalk, directly opposite each other, and forced by their mutual crowding to grow with the discs nearly vertical, instead of horizontal as normally. In *b*, the two heads are more closely united, while in *c* the fusion is complete, giving the appearance of an elongate and abnormally large inflorescence. The groove in the center of the disc is characteristic of such sports. In each case the peduncle was fasciated throughout its entire length. These double heads are not uncommon in the *Rudbeckia*, or yellow daisy.

Fasciation in Delphinium. — Abnormalities in the inflorescence of the lark-spur are of several varieties, and much of the literature is cited by Penzig. One of the earlier references to the subject is that of Fermond who, in his "Essai de Phytomorphie" (**2**: 321. Paris, 1864), described a variation in the inflorescence of *D. ajacis* analogous to "cyclochorize pollaplasique." The accompanying illustration, figure *d*, shows four flower-clusters collected in the New York Botanical Garden in the summer of 1907. At the left is a normal inflorescence, in striking contrast to which are the three fasciations at the right. All of the individual flowers appeared to be normal.

NEW YORK BOTANICAL GARDEN.

SHORTER NOTES

Bird Nests from Jamaica. — On our recent trip to Jamaica we had the pleasure of going down on the same steamer with the ornithologist of the New York Zoölogical Park and his wife, and spent one delightful afternoon together at Hope Gardens, among the flowers and the birds. The humming-birds are always the most attractive visitors to the flowers of the tropics and are naturally very much admired. I made an effort to secure the nests. That of the "doctor-bird," *Aithurus polytmus*, a large black humming-bird with two long tail feathers was sent to me from Cinchona where it was found suspended from the leaves of the pampas grass and is composed of the woolly scales of one of the tree-ferns, *Alsophila pruinata*. The outside is covered and bound together with a fine net-work of spider's web and ornamented with pieces of lichen. The eggs were white and fragments of them still remain in the nest. It measures 2½ inches in depth on the outside and 1 inch inside, is 6 inches in circumference and 1½ inches across the top and is wonderfully soft and light and a rufous brown color.

The humming-birds are particularly fearless and numerous in Jamaica and visit the flowers in the drawing-rooms daily, scolding if your presence annoys them and fluttering over your head. One of them attempted to make its nest in a vase of flowers at "Bullstrode" near Grange Hill.

We also have a nest of the Jamaica swift made of the down from various species of *Tillandsia*, presented to us by T. B. Sturridge, Esq., of Union Hill.

Elizabeth G. Britton.

Notes on Rutaceae.— **Xanthoxylum Nashii** Wilson, sp. nov.

A prickly shrub or small tree 3–4.5 m. high, with slender grayish branches; young twigs light gray, verrucose-glandular; stipular prickles in pairs, numerous, slender, straight or slightly curved, spreading, chestnut-brown, becoming gray with age; leaves odd-pinnate, 0.5–1.5 cm. long, the petioles, and rachis (if present), narrowly winged; leaflets 3, occasionally 5, obovate, truncate or rounded and often emarginate at the apex, cuneate at the base, minutely and often obscurely crenulate above the

middle, equilateral or occasionally inequilateral, sessile or subsessile, glabrous, coriaceous, lustrous above, pellucid-glandular, the glands few, scattered, the marginal glands larger; lateral leaflets 2.5–7 mm. long, 1–4 mm. broad, the terminal leaflet somewhat longer and broader; flowers not seen; calyx from under mature carpels, 1.5–2 mm. broad, the sepals 5, entire or denticulate; fruiting inflorescence lateral, sessile or subsessile; capsules one to three, sessile, obovoid, compressed, 6–9 mm. long, 5–9 mm. broad, blackish or brownish, the surface wrinkled; seeds orbicular, compressed, often truncate at the base, 5–6 mm. long, black, shining, smooth or slightly wrinkled.

Type collected in a xerophytic region near Gonaives, Haiti, *G. V. Nash 1579*.

Amyris texana (Buckley) Wilson, comb. nov.

Zanthoxylum texanum Buckley, Bull. Torrey Club **10**: 90. 1883.
Amyris parvifolia A. Gray, Proc. Am. Acad. **23**: 226. 1888.

Type collected by S. B. Buckley near Corpus Christi, Texas, April, 1882.

CASIMIROA EDULIS La Llav. & Lex. Nov. Veg. Descr. **2**: 2. 1825.

Zanthoxylum bombacifolium A. Rich. Ess. Fl. Cub. 329. 1845.
Fagara bombacifolia Krug & Urban, Bot. Jahrb. **21**: 567. 1896.

Sagra's specimen in the herbarium of the Academy of Natural Sciences, Philadelphia, agrees with Mexican material of *Casimiroa edulis*; the ovary in the Sagra specimen is abortive. It is very probable that the material upon which Richard based his *Zanthoxylum bombacifolium* was from a cultivated plant.

Specimens collected in Cuba by Bonpland and G. Don and referred by Dr. Urban to Richard's species have not been examined by me.

PERCY WILSON.

NEW YORK BOTANICAL GARDEN.

ANOTHER LEAF-SPOT FUNGUS OF THE APPLE. — During the past five years, I have been trying to find out what fungus it is that causes the defoliation of so many apple-orchards in West Virginia. An examination of hundreds of leaves from some of

the worst defoliated orchards shows that most of the fungi, heretofore associated with the defoliation of apple trees, were either not present or when present and even abundant did not bring about a defoliation. However, there was a fungus, one of the Tuberculariae, which was universally present in these orchards and occasionally on apple trees by the roadside. While I do not know that this fungus was primarily responsible for the defoliation, it caused a large amount of damage to the foliage. It was so plentiful in some orchards by the first of September that the lower branches of some of the trees were nearly defoliated, the remaining leaves being brown and crumpled.

The spots caused by this fungus are so different from the spots caused by other leaf-spot fungi of the apple that they can be readily recognized even when the fungus is not fruiting. In general, the spots are nearly circular, from five to fifteen millimeters in diameter, two or more frequently coalescing. In color, the spots are brown or brown mottled with gray, the two colors being arranged more or less concentrically or like contour lines on a map. In the center of some of the spots is a small gray or whitish spot, caused, perhaps, by a first infection of the leaf by some other fungus. The larger and encircling spots may, therefore, be due to secondary infection by the fungus under consideration.

The spore-fruits of the fungus might be easily overlooked, and probably have been, since they are on the under side of the leaf, of about the same color as the spots, minute, and hidden to a considerable extent by the pubescence of the leaf. The fungus is very similar to *Hymenula cerealis* E. & E. except that the sporodochia are considerably smaller (1 : 5) and the conidia a trifle plumper than those of the type specimen of *Hymenula cerealis* which I examined in the herbarium of the New York Botanical Garden. The shape and structure of the sporodochia are also more like those of an *Illosporium* than a *Hymenula*. On account of these differences, the name **Illosporium malifoliorum** n. sp. is tentatively proposed with the following description :

Spots suborbicular, or coalescing and becoming irregular, brown or sometimes mottled with gray and with a small gray

spot near the center, 5–15 mm. in diameter; sporodochia hypophyllous, minute, gelatinous, yellowish-amber and blackening, subspherical when moist (150 μ) becoming disc-shaped or irregular when dry (60–100 μ); sporophores branched; conidia hyaline, oblong, 1×3.5–4μ.

While examining specimens of other apple leaf-spot fungi in the herbarium of the United States Department of Agriculture, I came across this same fungus on a few leaves among specimens determined as *Phyllosticta pirina* Sacc. and collected by M. B. Waite at White Sulphur Springs, W. Va., and A. R. Blakely at Springdale, N. C., in 1889.

JOHN L. SHELDON.

WEST VIRGINIA UNIVERSITY,
MORGANTOWN, W. VA.

REVIEWS

Grout's Mosses with Hand-Lens and Microscope*

Part IV. of Mr. Grout's "Mosses with Hand-Lens and Microscope" equals the previously-issued parts in good type, excellent paper, and numerous, clear illustrations. More detailed explanations might well be given some of the full-page plates, remarks are too often included in the generic and specific descriptions, and the descriptions could be more readily compared if the same arrangement were regularly used; however, the "non-technical" character of the book as announced on the cover page is undoubtedly the author's justification for his treatment of the subject. Numerous short keys are given; these with the excellent illustrations should make the identification of our common mosses a very simple matter.

The Guide to Nature and to Nature Literature†

"The Guide to Nature and to Nature Literature," mentioned in the last issue of TORREYA, began publication with the April number. It is an "Illustrated monthly magazine for adults, de-

* Grout, A. J. Mosses with Hand-Lens and Microscope. Part IV. Pp. 247–318. pl. 56–75. figs. 134–195. Published by the author, Brooklyn, New York, 1908. $1.25.

† The Guide to Nature and to Nature Literature. Magazine. Illustrated. Official organ of the Agassiz Association. Editor, Edward F. Bigelow, Stamford, Connecticut.

voted to common-place nature with uncommon interest." It is also the official organ of the Agassiz Association, "the oldest, most extensive and most efficient organization in the promotion of the love and knowledge of nature."

The lack of a table of contents is less keenly felt by reason of an ingenious system of general headings spread through the text at irregular intervals. There are eleven of these, one temporarily without material to fill it, and their diversified character speaks volumes for the future scope and usefulness of "The Guide." It is unnecessary to enter into the details of all these divisions, but a few deserve passing mention.

Under the caption, "The Outdoor World," is an article by Professor Earl Douglas on fossil hunting, and another on "Our Eastern Calla Lily." In the latter the propriety of coining this new common name for the well-known skunk cabbage may be questioned. The attempt to attach a name long associated with *Zante deschia* to *Spathyema foetida* is justly doomed to failure. For common names are not made in an editor's office. They are rather the product of long years of a popular tendency to attach definitive names to the better known plants and animals. Under "Domesticated Nature" there is an interesting article on the origin of the Easter egg and Easter rabbit custom. In a slightly similar vein are "A Tendril Soliloquy" and a group of "astonishing experiences" with foxes. The correspondents submitting the latter have done the editor a very perilous service, for the strain on the reader's credulity is great, and recent press discussion of such "astonishing experiences" has been exceedingly keen.

"The Camera" affords an illustrated article on "Interesting Cloud Effects" and also a good description of a home-made photomicrographic apparatus. The photographs under "Bird Haunts" seem to lack significance, since there is no visible sign of a bird or a bird's nest.

"The Twin Periodicals" is an editorial confession of faith and it is in this that we find what is to be the future scope and ideal of "The Guide." After a gentle criticism of two widely known magazines devoted to outdoor life in America, and the expres-

sion of a pious hope that "The Guide" will not follow their habit of "delineating a metropolitan wealth," we read the following: "It will not deal entirely nor frequently in 'glittering generalities,' although it hopes to sparkle sometimes, and at all times to glow steadily with the fire of nature's inspiration, fanned by the breezes that swing above the fields and toss the clouds across the sun. The sight of a leaf lying on a cluster of bluets in a grassy meadow will be more welcome, and will more thoroughly merit a full-page illustration, than will a thousand fur rugs of (*sic*) a roomful of priceless tapestries. It will be a guide to nature, not a sign-post to point out the useless things that unlimited wealth can buy. A description and picture of an invisible object as it appears under the microscope will give 'The Guide' greater satisfaction than the portraits of forty bulls of Bashan." Thus Mr. Edward F. Bigelow, editor.

The whole tone of the paper is one of enthusiastic love of nature, and this will almost atone for distressing shortcomings. The task of bridging the gulf between the natural scientist and the general reader is always difficult. There is the tendency on the one hand to write dry facts in a colorless style; on the other to dispense highly readable but dangerously colored "Nature Faking." It would be a delirium of optimism to expect "The Guide" to bridge successfully this gulf, for bigger and stronger efforts have failed. But an editorial enthusiasm that allows the publication of "astonishing experiences" with foxes will be nothing daunted by the failure of previous efforts. And it is a matter for congratulation that an editorial assurance which sees no very urgent necessity for apologies for this first issue, did not turn out something much worse.

There is doubtless room for a paper that will print nature items of "uncommon interest." And an editor who can improvise upon the theme of a climbing tendril is sure to please a certain class of readers. But neither of these facts would seem to furnish any very vigorous reason for the existence of "The Guide" as an interpreter of either the esthetic or scientific phases of nature work.

The magazine is a well-printed and illustrated sheet of thirty-two pages with the usual advertisements. NORMAN TAYLOR.

PROCEEDINGS OF THE CLUB *

May 12, 1908

The Club met at the American Museum of Natural History at 8:30 o'clock. In the absence of the President and both Vice-Presidents, Dr. N. L. Britton was called to the chair. Sixty-five persons were in attendance.

After the reading and approval of the minutes for April 29, 1908, the Club listened to a very interesting lecture on "Wild Flowers of Spring," by Dr. N. L. Britton. The lecture was illustrated by lantern slides made by Mrs. Cornelius Van Brunt, illustrating in natural colors the flowers of the local spring-blooming plants.

Adjournment was at 9:30 o'clock.

C. Stuart Gager,
Secretary.

OF INTEREST TO TEACHERS

The sixth question of the list given in the March Torreya was discussed in the April issue; below are other letters of interest which bear upon the same question: Why does not the study of high school botany more often create a lasting interest? Would this be secured by more emphasis on morphology, including classification?

I

The popularity of such books as How to Know the Wild Flowers and the many guides to trees, ferns, etc., shows very plainly the trend of common interest in the subject. I cannot at this moment think of one popular guide to experiments with plants such as we find for physics or chemistry.

Plant study presents itself to me in three important phases; in the first the plant may be viewed as a living organism whose structure and activities may be studied from about the same standpoint as that of the animal (human) body. Beyond general facts this study will be pursued by few other than specialists. We shall take the facts as we find them (about as we do those of

* The proceedings for April 29 will be given in the July number.

human physiology) and expect the specialists to set us right from time to time.

Another phase which seems to me important is a knowledge of plants as national resources — their relation to great human interests. The forest service and agricultural work keep us in touch with this.

The other side is the study of our own plants — their variety and beauty as we find them. If this is is carried on out of doors — as most of it should be — and sufficiently to make children really intelligent — the interest ought to be lasting because this is an accessible field for study. It seems to me that more guides and keys would greatly aid in this work.

ANNA CLARK.

THE NEW YORK
TRAINING SCHOOL FOR TEACHERS.

II

If it is not too late, I should like to enter the discussion of the interesting topic presented in your Teacher's Department in April. Your question, "Why does not the study of botany more often create a lasting interest?" suggests that somehow botany is inferior to other subjects in establishing permanent interest in high school pupils. I know that this is the prevailing opinion regarding science subjects in general, and the biological in particular; but my observations lead me to disagree with it decidedly. I think your question might be fairly answered by asking a similar one, namely, why do not secondary school subjects in general more often create a lasting interest in the minds of pupils? I do not mean to say that I think there is no possibility for improvement in botany and other subjects, so far as arousing interest is concerned; but I am inclined to think that we sometimes expect too much when we look at botany in the secondary school from the standpoint of our experience as professional biologists. We must sooner or later begin to recognize the fact that a large proportion of people are not and probably cannot be prepared to view the world through the eyes of the naturalist, and hence I think it is not to be expected that a very large proportion of

pupils should gain from the high school study of botany an abiding and enthusiastic interest in the subject. For my part, I am very much more interested in the question whether high school botany so influences the mental habits and outlook of pupils that by this study they are made citizens of more general culture and ability; and the question whether or not they remain enthusiastic students of botany as such seems to me to be one of decidedly minor importance. As an illustration, I look back upon my own high school work in languages and mathematics as the most profitable work in my preparation for college, and yet if my present interest in these subjects is to be judged by the amount of time which I have given to them in the last ten years I think I might reasonably ask why did not my high school studies of languages and mathematics create a more lasting interest? The question of apparent interest is largely determined by the future application, and it has happened that I have had no particular demand for direct application of my high school Latin and Greek and mathematics. However, I can trace quite definitely in my own mind the valuable influence of such study upon my college and later work and hence I feel satisfied that the general educational value of the languages and mathematics study in the high school was a sufficient justification of their presence in the curriculum. I am forced to apply the same line of reasoning to science in the high school, and hence I fail to see that we can judge the value of a high school course on the basis of the pupils' lasting interest in the subject-matter of the sciences studied.

M. A. Bigelow.

Teachers College, Columbia University.

III

Before attempting to answer the question why the study of botany in the high school does not more often create a lasting interest in the subject, it may be pointed out that no other high school subject is better circumstanced in this respect. In fact, if we compare the interest taken in botany, aside from any money there may be in it, with similar interests in chemistry, physics, geology, or zoölogy as a whole, we shall find that botany is far in the lead.

The question, then, looked at from a different angle, reads "How can the lead which botany has over other studies be increased?" For the purposes of our inquiry we may divide all who are interested in botanical pursuits into two groups — the botanists and the botanizers. The botanist I would define as a person interested in the science of botany, the botanizer as one interested in plants without much interest in or regard for the science. It requires a peculiar type for the botanist. He must have an inquiring turn of mind, a love of study, a respect and regard for knowledge and an irresistible persistence in delving into the secrets of nature. It may be doubted whether this type of mind can be developed by any sort of schooling in individuals in whom it is not latent. This is why your good botanical pupil ceases to be interested as soon as the course is finished and also why some individuals with few or no advantages force their way to the front. The latter are botanists, born; the others are not. Occasionally the schools succeed in making a good imitation botanist, but the spurious article is easily detected.

The botanizer has but a passing interest in the studies of the botanist. He is attracted to botany by the love of beauty and the joys of discovery. The bright hues, pleasant perfumes, and varied forms of the flowers appeal to his senses and incline him to make a collection, while his wanderings afield are principally to find a new flower, a flower newly in bloom, a plant in a new place, or a new combination of plants. The spirit of discovery animates both botanist and botanizer, but each applies it in a different way. The botanizer asks for the name of a new flower, where it grows, when it blooms and what it is good for, but he is seldom interested in its marvellous devices for pollination or seed-dispersal and mere weeds do not attract him unless they have showy flowers.

There seems to be very little change needed in high school courses designed for the education of the botanist. With almost any kind of a start he may be depended upon to take care of himself, but if we are to cultivate the botanizer — and there is an immense number of his kind — very radical changes must be made. We seldom realize how many people there are interested

in plant life without making pretentions to being botanists. Four hundred and ten thousand are on the subscription lists of Park's Floral Magazine — a publication that doubtless the majority of botanists never heard of, though it is one of the oldest of our botanical publications. One hundred and seventy-five thousand subscribe to Vick's, Floral Life has 100,000 more and the Garden magazine has 50,000. If we should include publications devoted to farming and gardening still more astonishing figures could be secured.

I am convinced that this is the side of botany that high schools will find most worth while to cultivate. It can be, and is being, advanced by means of school gardens, horticultural and floricultural courses, courses in structural botany and studies in the flora of the surrounding region.

The reason for lack of apparent interest in college is not difficult to find. Since the motto of the present generation is money first and culture afterward, botany, which can offer no such lucrative inducements for its study as can the mechanical and physical sciences, is naturally passed by. The intelligent person, however, who realizes that making a living and enjoying a living are two different things, will continue to take up botany and every wise teacher will encourage him to do so by every means in his power.

WILLARD N. CLUTE.

JOLIET HIGH SCHOOL,
JOLIET, ILLINOIS.

The Museums Journal of Great Britain for March contains an article by G. A. Dunlop which describes "Drying Plants without Pressure" by the use of fine sand or boxwood sawdust, the latter material preserving many of the natural colors and much of the texture of flowers and leaves.

Seven of the "Tabulae Botanicae" by the Berlin publishers, Gebrüder Bornträger have been completed. The charts are large, with clear, accurate figures, and helpful text printed in German, French, and English. The figures are not the ones so commonly used in text-books. One chart illustrates stomata; the others are devoted to the moulds and the myxomycetes.

Among the papers included in the Annual Report of the Director of Botanical Research in the Carnegie Institution (Dr. D. T. MacDougal) for 1907 are "The Advance and Recession of Vegetation in the depressed Basins of the Colorado Delta," "Acclimatization," "Distribution and Movements of Desert Plants," "The Topography of Chlorophyll Apparatus," "Physiology of Stomata," "Evaporation and Plant Distribution," and "The Relation of Evaporation to Plant Activity."

The New York *Tribune* prints a timely remonstrance on its editorial page: "Arbor Day, more suitable in this region for the cultivation of aquatic plants by amphibians than anything else, is past and gone. It would be interesting to know whether it saw more trees planted or destroyed. For while school children and others were busy with spade and shovel the trolley folk and electric linemen were also active, and the work of wires already strung in chafing and burning and mutilating trees by the roadside went steadily on." It may seem futile to add one more thing to the rapidly expanding school curriculum, but an Arbor Day that does not include the phase of tree preservation suggested by the *Tribune* falls far short of the needs of to-day.

G. P. Putnam's Sons have recently published "The Alpine Flora of the Canadian Rockies" by Stewardson Brown and Mrs. Chas. Schaeffer. Dr. Brown is responsible for the text and Mrs. Schaeffer for the unusually fine colored illustrations which have been prepared from her photographs and water color paintings. The book is designed to meet the needs of tourists in the Canadian Rockies and is therefore popular rather than purely scientific in its character. Although our imperfect knowledge of the flora of the Canadian Rockies makes impossible at this date a complete flora of that region, a catalogue of distinct value to the botanist was published last fall by the University of Pennsylvania under the title "Contributions to a Catalogue of the Flora of the Canadian Rocky Mountains and the Selkirk Range" by Edith M. Farr.

CAROLINE ROMER.

NEWS ITEMS

Victor E. Emil, Ph.D., of the Harvard Medical School, has been appointed instructor in biology at the George Washington University.

Mr. Chas. T. Vorhies, of the University of Wisconsin, has been elected to the chair of biology in the University of Utah.

Professor John M. Macfarlane, professor of botany in the University of Pennsylvania, has returned from a collecting trip in the Gulf states.

Dr. S. O. Mast, Johnston professor of biological science at Hope College, has been appointed associate professor of biology at the Woman's College of Baltimore.

Dr. Clifton D. Howe, associate director of the Biltmore Forest School, Biltmore, North Carolina, has accepted an appointment as lecturer in forestry in the University of Toronto.

The Summer School of the Connecticut Agricultural College, which holds its seventh annual session July 1 to 24 inclusive, offers special courses in nature study and elementary agriculture. The school is planned to meet the needs of teachers and others interested in outdoor life.

E. C. Parker, assistant agriculturist at the Minnesota Experiment Station, will sail on June 30 to become expert adviser to the government officials of Manchuria. With W. H. Tombave, now connected with the University of Pennsylvania, he will be employed in instituting modern methods of agriculture in Manchuria.

Dr. Charles A. Kofoid, associate professor of histology and embryology in the University of California and assistant director of the San Diego Marine Biological Laboratory, has been granted leave of absence and will spend the coming academic year in Europe, principally at Munich and Naples. He will also deliver lectures in Liverpool and London.

Professor Leslie A. Lee, of Bowdoin College, who is noted especially for his research expeditions in Labrador and South

America, died May 20, at the Maine General Hospital. He was born at Woodstock, Vermont, in 1852. Since 1881 he had been professor of geology and biology at Bowdoin College, also instructor in geology and evolution at Bangor Theological Seminary.

A special summer meeting of the American Association for the Advancement of Science will be held at Hanover, New Hampshire, from June 29 to July 3, 1908, in the buildings of Dartmouth College. Section G may hold no sessions, but full information as to program, railroad rates, and hotel accommodations may be obtained from the secretary, Dr. L. O. Howard, Smithsonian Institution, Washington.

By arrangement with the Bermuda Natural History Society, the Station for Research at Agar's Island will be open for about seven weeks this summer. There are accommodations for a limited number of instructors or research students in either zoölogy or botany. Steamers leave June 16 and June 30, thus making possible sessions of 48 or 34 days; the cost of passage, board and lodging will be $110, or for the shorter session, $90.

The fifth annual field "symposium," in which the Philadelphia Botanical Club, the Washington Botanical Club, and the Torrey Botanical Club will coöperate, will be held at Georgetown, Delaware (vicinity Lewes, Rehoboth, and Indian River), July 1 to 8, instead of July 6 to 12, as announced previously. The change was made for those having a short holiday on the Fourth. The headquarters will be at the Eagle Hotel, the rates being $1.50 per day (perhaps less per week).

The Conference of Governors on the Conservation of the Natural Resources of the Country, held in the White House, May 13–16, was followed closely by appropriate Congressional action; measures have been adopted for the appointment of a commission to go over the ground and report as to the necessity and cost of such reserves. It also gives the consent of Congress to states which desire to coöperate with the government in conserving their natural resources and protecting their navigable streams. The resolutions framed by the governors included the

following paragraph of especial interest to botanists: "We urge the continuation and extension of forest policies adapted to secure the husbanding and renewal of our diminishing timber supply, the prevention of soil erosion, the protection of headwaters, and the maintenance of the purity and navigability of our streams. We recognize that the private ownership of forest lands entails responsibilities in the interests of all the people, and we favor the enactment of laws looking to the protection and replacement of privately owned forests."

The American Association for the Advancement of Science which meets in Baltimore for the June convocation week will devote one day to the celebration of the centennial of the birth of Charles Darwin (February 12, 1809) and the semicentennial of the publication of the "Origin of Species" (November 14, 1859). The program so far as arranged contains the following appropriate titles: "Natural Selection from the Standpoint of Zoölogy," by Edward B. Poulton, Oxford University; "Natural Selection from the Standpoint of Botany," by John M. Coulter, University of Chicago; "The Direct Effect of Environment," by D. T. MacDougal, Carnegie Institution of Washington; "Mutation," by C. B. Davenport, Carnegie Institution of Washington; "The Behavior of Unit Characters in Heredity," by W. E. Castle, Harvard University; "The Isolation Factor," by David Starr Jordan, Stanford University; "Adaptation," by C. H. Eigenmann, Indiana University; "The Bearing of Recent Cytological Studies on Heredity and Evolution," by E. B. Wilson, Columbia University; "Evolution and Psychology," by G. Stanley Hall, Clark University; and "Recent Paleontological Evidence of Evolution," by Henry Fairfield Osborn, Columbia University. It is proposed to print these addresses in a volume to appear during the centennial year.

Dr. C. Stuart Gager, director of the laboratories of the New York Botanical Garden since February 1, 1906, has accepted the appointment of professor of botany in the University of Missouri, at Columbia, Mo. The above will be Dr. Gager's address after September 1, 1908.

TORREYA

July, 1908

Vol. 8 No. 7.

SUGGESTIONS FOR FUTURE WORK ON THE HIGHER PLANTS IN THE VICINITY OF NEW YORK*

By Roland M. Harper

New York is one of Nature's strategic points. Three very important and entirely independent physiographic lines which do not intersect at any other one point, namely, the terminal moraine, the fall-line, and the coast line, pass right through the city, which therefore includes within its limits parts of the ancient highlands founded on solid rock, the unconsolidated coastal plain, and glaciated and unglaciated portions of both, as well as the beaches, dunes, and marshes of the coast itself, which is as distinct from the coastal plain as that is from the highlands. There is probably not another spot in North America, if in the world, which exhibits so much natural diversity in its immediate surroundings. Within fifty miles of here are considerable areas of Archaean, Palaeozoic, and Triassic rocks, some of them forming considerable mountains, as well as the nearly flat expanse of the Cretaceous and Tertiary coastal plain of Long Island and New Jersey, some of it covered with pine-barrens and some with fine oak forests. A circle with New York as its center and a radius of 100 miles, as shown by the Preliminary Catalogue of Anthophyta and Pteridophyta published by the Club in 1888, includes over half the species of vascular plants credited to the northeastern United States and adjacent Canada.

The earliest botanists in this rich region had their hands pretty full with merely collecting, identifying, and enumerating the flowering plants they found. Many species were at once seen to be new to science, and such had to be carefully compared and described;

* Read at a meeting of the Torrey Botanical Club, April 29, 1908.

[No. 6, Vol. 8, of Torreya, comprising pages 125–152, was issued June 30, 1908.

though most of the describing was done by European botanists up to about a hundred years ago. Others which were at first supposed to be identical with species already known from the Old World were gradually segregated and described as new. But by the middle of the nineteenth century the supply of new species of flowering plants and ferns in this part of the country had been almost exhausted, except in a few difficult groups which were beyond the comprehension of the average student. Even as far back as 1829 Amos Eaton made this statement in the preface of the fifth edition of his Manual of Botany: "There is not, probably, 50 undescribed species of Phenogamous plants in the United States — perhaps not one species, east of the Mississippi." (He lived to see the utter fallacy of this estimate, however.)

At an early period in the history of American botany, the recording of new localities for rare plants, and preparing floras of certain limited areas, became the favorite pursuits of the more ambitious amateurs, and the first few volumes of several of our best-known botanical journals were very largely devoted to studies of this kind. Good work in regional botany is still being done, but in this part of the country it is now hardly possible to prepare a "local flora" of the ordinary type without repeating a great deal that has already been published.

In the latter part of the 19th century many botanists who possessed the necessary training and equipment became diverted into the comparatively untrodden fields of anatomy, physiology, pathology, and cryptogamic botany. The opinion was expressed by a prominent botanist in a public address about twenty years ago that in the Eastern United States the non-professional botanist, without extensive library and herbarium facilities, could make the best use of his time available for research by studying the histology and development of particular plants. This kind of work is indeed valuable when well done, and the field is well-nigh inexhaustible, but the technique required for its successful prosecution places it beyond the reach of most of us.

The nomenclature agitations which began in this country about twenty years ago contributed hundreds of pages to botanical literature, and kept all classes of botanists busy for awhile learn-

ing new names in rapid succession. By the time comparative calm was restored, ecology came into prominence, and opened up a vast field for botanical research, which was quickly taken advantage of by many young students and even a few of the older men who had been trained in the herbarium or "lie-flat" school. (Up to this time, it should be observed, plants had been studied separately, *i. e.*, without reference to environment or associates, by systematist, phytogeographer, and physiologist alike.) But the fact that this new branch of science was soon invested with technicalities, and studied with the aid of elaborate apparatus, doubtless deterred many amateurs from following it. There was also a feeling in some quarters, especially in the eastern strongholds of conservatism, that ecology contained nothing new, that it was merely a rehashing of old facts which had long been known to botanists. And indeed it has not produced the striking results that some of its enthusiastic advocates expected it would, and in the last two or three years there has been a perceptible falling-off in the number of papers annually devoted to it.

Since the beginning of the present century the problems of mutation, hybridization, and experimental evolution have given occupation to a few specially trained investigators, and their work promises to be of great economic as well as scientific value; but it calls for persons of exceptional talents who are able and willing to spend years on a single problem before announcing results, and it has not measurably increased the opportunities of the amateur as yet.

At the present time nearly all the American botanical literature of permanent value is being produced by persons officially connected with museums, laboratories, and other institutions of research, or in other words, by professional botanists; but there is no sufficient reason why this state of affairs should continue indefinitely. Notwithstanding the serious inroads of civilization around New York, and the vast amount of work which has already been done on the plants of this vicinity in field, herbarium, laboratory, and library by several generations of the best-trained botanists in America, there are still awaiting solution here innumerable botanical problems which can be successively attacked

by any one possessed of a manual, a fair knowledge of plants, and a little spare time and perseverance. Some of them are distinctly outdoor problems, while others are of a statistical nature, and can be studied at home in winter and inclement weather, with the aid of field notes and a few books. For the amateur who wishes to make his work count the occasional assistance of a person familiar with botanical literature, to prevent duplication of research, is eminently desirable, but that is easily obtained in such a botanical center as New York.

Botanical field workers have always been inclined to pay too much attention to rarities, like mere curio collectors; and although it cannot be denied that finding rare plants is one of the botanist's chief pleasures, at the same time we can generally learn more from the common ones. It is really more important to determine what species are most abundant in a given region or plant association than to discover the rarer ones or even to make a complete list. Besides the common and rare plants there is another important category, commonly overlooked because they cannot be collected nor usually recorded in the field; namely, species which are absent from a given area or habitat and present in similar or neighboring areas.

In preparing local floras we should not be content with merely enumerating localities and habitats, unless the area is very small or very homogeneous. In a region with geometrical or political boundaries the distribution of each species should be correlated as far as possible with that of the various environmental factors, such as climate, altitude, geology, topography, etc. For instance, in this vicinity *Ilex glabra* seems to be confined to the coastal plain, *Quercus Prinus* to hilly or rocky regions, and certain ferns to limestone; while many species skip the pine-barrens, others do not grow near salt water, etc.

Most field botanists, especially in the northeastern states, have hitherto studied floristics rather than vegetation. The relations between these two concepts are analogous to those between orthography and grammar, grammar and literature, chronology and history, census statistics and geography, anatomy and physiology, or anthropology and sociology. In other words, while

the first is almost essential to the second, the second is far more interesting and valuable.*

The portions of the Eastern United States whose vegetation has been described in anything like a thorough manner at present constitute scarcely one per cent. of the whole, and, curiously enough, descriptions of vegetation are scarcest for some of the states in which botanists are and always have been most numerous. The plant habitats of the vicinity of New York are almost as little understood to-day as the plants themselves were in the time of Linnaeus, and even in some of the latest systematic works habitats are treated as unscientifically as plants are in non-botanical literature.†

North of latitude 35° and east of the Mississippi River no systematic classification of habitats seems to have yet been attempted for an area as large as a whole state,‡ though it would be a far simpler task to classify the few score of habitats in this part of the world than it has been to classify the several thousand species of plants.

An adequate description of a habitat would require as many words as a plant description, and would be out of place in the literature of systematic botany; but we should have a system which would enable us to designate any habitat accurately with not more than two or three words, just as a binomial or trinomial technical name suffices to designate any plant. Some ecologists believe that habitat names should be formed from the ancient languages, but it would seem as if our own language should be sufficient for the purpose, and that too, perhaps, without coining any new words. Of course there are now many short habitat names in common use, just as there were plant names before the days of systematic botany, but most of these are used rather

* For brief but illuminating comparisons of floristics and ecology see Clements, Research Methods in Ecology, 7–9. 1905; Bray, Bull. Univ. Tex. 82: 59–60. (Distribution and adaptation of the vegetation of Texas). 1907.

† See in this connection W. M. Davis, Am. Nat. 23: 579. 1889.

‡ An excellent beginning in classifying the vegetation of a small part of New England, with the novel feature of keys and descriptions for the habitats, was made by J. W. Blankinship in Rhodora for May, 1903, but it has not yet been followed up by any one else in that region.

loosely, and need to be given greater precision. For instance such familiar expressions as thicket, copse, glade, swale, grove, meadow, pine-barren, marsh, swamp, pond, sand-plain, and rich woods have never been adequately defined in terms of physiography, soil, and vegetation.

Photographs of vegetation are even scarcer than descriptions. Those for Connecticut, New York, and New Jersey which have hitherto appeared in botanical literature can almost be counted on the fingers, while some of the newer and more thinly settled states, such as North Carolina, Florida, Michigan, and Illinois, can make a much better showing in this respect. If members of the Club who possess the necessary apparatus would preserve records of the aspects of some of the natural habitats in this vicinity which are fast disappearing they would render a service of inestimable value to science.

As examples of natural vegetation within easy reach, the dunes and marshes of our coast are still in very nearly the same condition as they were a thousand years ago, and they offer a fertile field for study. We have as yet practically no description of any strand vegetation between Sandy Hook and the Bay of Fundy. The Palisades, which are almost in a class by themselves, have been greatly neglected by botanists. The largest natural body of fresh water and the highest hill on Long Island seem never to have been mentioned in botanical literature at all. The pine-barrens of Long Island and New Jersey have been damaged somewhat, but their original condition can be reconstructed fairly accurately. But all these places are being encroached on more and more every year, and they should be investigated without delay.

Turning to problems on a smaller scale, and perhaps more easily comprehended by beginners, it might be remarked that there is probably not one native species in North America whose average flowering period for any given locality has been determined within a week, and there are thousands of which we do not even know exactly the months in which their average periods begin and end. For most habitats we have only the vaguest idea of what proportion of the species are likely to be found in

bloom on any given date, or how long the flowering period of the average species in the habitat lasts, or at what hours the different flowers open and close,* which ones open only once and which open and close for several days in succession. These and numerous other phaenological problems which might be cited require no special knowledge for their investigation, and much can be done with them in a single season by any one who can get out in the field every week or so. For those who have some knowledge of entomology the study of the insect visitors of flowers presents an attractive field which has not been worked as much in this part of the country as it has farther west.

The exact mode of dissemination is practically unknown in many of our commonest plants, for example in such familar genera as *Panicum*, *Cyperus*, *Scirpus*, *Carex*, *Juncus*, *Polygonum*, *Hepatica*, *Potentilla*, *Lespedeza*, *Polygala*, *Lechea*, *Kneiffia*, *Convolvulus*, *Utricularia*, *Plantago*, *Ambrosia*, *Rudbeckia*, *Helianthus*, and numerous others easily recalled. And yet almost any plant ought to give up its secrets to the student who has patience enough to sit down beside it for awhile at the proper time.†

The local distribution of many species which reach their limits in this vicinity is very imperfectly known, even in the case of such common trees as *Pinus echinata*, *P. virginiana*, *Larix*, *Chamaecyparis*, *Quercus minor*, *Q. marylandica*, *Q. Phellos*, *Magnolia virginiana*, and *Liquidambar*.

A great deal of valuable information about the common names and economic properties of our native plants can still be obtained by going out in the rural districts and interviewing people who have never been influenced in any way by botanical literature.

* The time of opening and closing of flowers is not such a trivial matter as it might seem at first thought. It is one of the chief characters by which *Kneiffia* and *Oenothera* are distinguished, and it might prove equally useful in other groups which have not been so well studied.

† Such studies as these are commonly supposed to belong strictly to ecology; but would not systematic botany be considerably enriched if to the description of each family or genus could be added a few words concerning pollination and dissemination, instead of noting only such characters as are obtainable from herbarium specimens? As the mode of dissemination is usually the same throughout a genus, and even throughout some of the smaller families, such information would add very little to the size of our manuals, even if nothing of less importance was omitted to make room for it.

The character of some of the many unsolved botanical problems which confront us can perhaps be illustrated best by the following set of questions.* These are submitted with the assurance that answers to most of them have never yet been attempted, although they should present no great difficulties. Members of the Club who can suggest answers, or other questions of similar nature, are urged to do so.

What proportion of our local flora (or of the flora of any particular region or habitat) consists of trees? shrubs? vines? evergreens? parasites? annuals? biennials? anemophilous species? conifers? monocotyledons? grasses? sedges? Rosaceae? Leguminosae? Umbelliferae? Ericaceae? Compositae?

In what habitat or habitats is each of the above groups (or any other large group of plants) most prominent?

To what families and habitats do most of the plants belong that bloom in spring? summer? fall? What is the first spring flower in each habitat?

Why are some species common and some rare? Do the common and rare ones tend to belong to any particular habitats or taxonomic groups?

Do closely related species (not merely congeneric, but so close that no others come between) ever have the same range or habitat, or both? If so, do they ever grow close together? Give examples, if possible.

In what families and genera do natural hybrids occur?

Are two modes of dissemination ever found in the same genus? Give examples.

In what families, genera, and habitats do we find plants that perform sleep movements? Plants with fleshy or barbed fruits? With blue or red or odorous flowers? Carnivorous plants?

What weeds prefer roadsides? pastures? vacant lots? cultivated fields? abandoned fields? barnyards? burned areas? recent clearings? What proportion of annuals, biennials, and perennials in each habitat?

* Editor's note. — Here is abundant material for field work in our high schools, normal schools, and colleges. The questions will also prove suggestive for work during the long vacations which most teachers consider difficult to plan.

On Long Island what species grow only north or south of the "backbone" of the island? (A similar inquiry could be made relative to the terminal moraine in New Jersey and Pennsylvania.)

What species occurring at similar altitudes and latitudes on the mainland are wanting on Long Island, and why? What species native in Suffolk County do not grow in Nassau or Queens, and *vice versa*? To what families and habitats do such species mostly belong?

Why do a good many pine-barren plants occur in the eastern half of Long Island and not in the western half?

What native species and genera in our vicinity are common to the Pacific slope? the West Indies? South America? Europe? Asia?

What proportion are endemic to Eastern North America?

What proportion of the species in our local flora, or in the northeastern states, were known to Linnaeus? Michaux? Pursh? Torrey & Gray?

What proportion still bear the names that these authors used for them?

What species have their type-localities in this vicinity (or in any limited area, such as New Jersey)?

What new genera (if any) were discovered in the northeastern United States during the 19th century?

What geographical names in this vicinity were derived from native plants?

What are the natural (or prehistoric) habitats in this vicinity of *Pinus virginiana, P. Strobus, Juniperus virginiana, J. communis, Acorus Calamus, Spathyema foetida, Juncus effusus, J. tenuis, Andropogon scoparius, Panicum virgatum, Scirpus atrovirens, Carex lurida, Juncoides campestre, Smilax rotundifolia, Juglans nigra, Carpinus caroliniana, Betula populifolia, Quercus alba, Q. palustris, Q. Phellos, Morus rubra, Ulmus americana, Celtis occidentalis, Polygonum pennsylvanicum, Polygonella articulata, Claytonia virginica, Liriodendron, Ranunculus abortivus, Menispermum, Sassafras, Liquidambar, Rubus occidentalis, Potentilla canadensis, Prunus serotina, Cassia marilandica, Gleditschia, Robinia Pseudacacia, Acalypha virginica, Rhus hirta, R. glabra, Ilex opaca,*

Celastrus scandens, Sarothra gentianoides, Oenothera biennis, Isnardia palustris, Cornus alternifolia, Epigaea, Gaultheria, Fraxinus americana, Diospyros, Obolaria, Gentiana crinita, Bartonia, Asclepias syriaca, Convolvulus Sepium, Verbena hastata, V. urticaefolia, Prunella vulgaris, Linaria canadensis, Pedicularis canadensis, Melampyrum, Plantago Rugelii, P. virginica, Houstonia caerulea, Sambucus canadensis, Lonicera sempervirens, Micrampelis lobata, Specularia perfoliata, Ambrosia trifida, A. artemisiaefolia, Xanthium canadense, Eupatorium perfoliatum, Chrysopsis falcata, Solidago canadensis, Aster Novae-Angliae, Antennaria plantaginifolia, Anaphalis, Erechthites, and the various species of *Panicum, Chaetochloa, Carex, Sisyrinchium, Rubus, Fragaria, Crataegus, Viola, Physalis, Lactuca, Solidago, Euthamia*, and *Aster?*

Are *Pinus echinata, P. virginiana, P. Strobus, Larix, Picea, Tsuga, Eriocaulon decangulare, Betula nigra, Quercus acuminata, Q. Phellos, Morus rubra, Platanus, Prunus serotina, Rubus occidentalis, Acer saccharinum, A. pennsylvanicum, Diervilla* (and various other species) native on Long Island? If so, where? (Many supposed native species in other regions should be subjected to similar inquiries.)

Some of the above questions may seem at first to be of no earthly use, but if studied conscientiously their bearing on other important problems will become evident, and at the same time entirely unexpected lines of inquiry may be developed. All of nature's laws are worth knowing, whether they seem to have any immediate practical bearing or not. Of course most of us do not have much time for field work, but what time we do have might as well be spent in studying some of the newer phases of botany, and making distinct contributions to knowledge, as in merely collecting and identifying plants as our predecessors did a hundred years ago. If in all our field work the structures and adaptations of plants are studied in relation to environment and distribution many interesting correlations can be made, and we will gradually come to understand why each species grows where it does, which ought to be the aim of every field botanist.

The following discussions of the past, present and future prob-

lems of American botany will be found full of valuable suggestions along the lines above indicated. Most of them are public addresses by well-known men, and nearly all can be found in the library of the New York Botanical Garden. The arrangement is chronological.

Brendel, F. Historical sketch of the science of botany in North America from 1635 to 1840. Am. Nat. **13**: 754–771. D 1879; Do. 1840 to 1858. Am. Nat. **14**: 25–38. Ja 1880.

Gray, Asa. Remarks concerning the flora of North America. Am. Jour. Sci. III. **24**: 321–331. N 1882; Bot. Gaz. **7**: 129–135, 139–143. 1882; Proc. A. A. A. S. **31**: 449–460. 1883.

Farlow, W. G. The task of American botanists. Pop. Sci. Mo. **31**: 305–314. Jl 1887. Abstract in Bull. Torrey Club **14**: 173–174. Au 1887.

McCarthy, G. The study of local floras. Jour. Elisha Mitchell Sci. Soc. **4**[1]: 25–29. 1887.

Coulter, J. M. The future of systematic botany. Proc. A. A. A. S. **40**: 293–304. 1892.

MacMillan, C. On the emergence of a sham biology in America. Science **21**: 184–186. 7 Ap 1893. (Discussed by four other persons in later numbers of the same volume.)

Trelease, Wm. Botanical opportunity. Bot. Gaz. **22**: 193–217. S 1896.

Kearney, T. H. The science of plant ecology. Plant World **2**: 158–160. Jl 1899.

Barnes, C. R. The problems and problems of plant physiology. Science II. **10**: 316–331. 8 S 1899; Proc. A. A. A. S. **48**: 263–288. D 1899.

See especially pages 327–329 and 282–286, on ecology and plant names.

Halsted, B. D. The new field botany. Pop. Sci. Mo. **56**: 98–105. N 1899.

Trelease, Wm. Some twentieth century problems. Science II. **12**: 48–62. 13 Jl 1900; Proc. A. A. A. S. **49**: 249–272. 1901.

Underwood, L. M. The last quarter — a reminiscence and an outlook. Science II. **12**: 161–170. 3 Au 1900.

Hitchcock, A. S. A brief outline of ecology. Trans. Kan. Acad. Sci. **17**: 28–34. 1901.

Robinson, B. L. Problems and possibilities of systematic botany. Science II. **14**: 465–474. 27 S 1901.

Trelease, Wm. The progress made in botany during the nineteenth century. Trans. Acad. Sci. St. Louis **11**: 125–142. 26 N 1901.

Haddon, A. C. The saving of vanishing data. Pop. Sci. Mo. **62**: 222–229. Ja 1903.

Spalding, V. M. The rise and progress of ecology. Science II. **17**: 201–210. 6 F 1903.

Ganong, W. F. The cardinal principles of ecology. Science II. **19**: 493–498. 25 Mr 1904.

Cowles, H. C. The work of the year 1903 in ecology. Science II. **19**: 879–885. 10 Je 1904.

Reed, H. S. A brief history of ecological work in botany. Plant World **8**: 163–170, 198–208. 1905.

Robinson, B. L. The problems of ecology. Cong. Arts & Sci. (St. Louis, 1904) **5**: (1–13). 1906.

Underwood, L. M. The progress of our knowledge of the flora of North America. Pop. Sci. Mo. **70**: 497–517. Je 1907.

Some suggestions as to interesting and unusual ways of working up a local flora can also be found in Beal & Wheeler's Michigan Flora (1892), and on the first thirty pages of Beal's Michigan Flora (Fifth Report Mich. Acad. Sci., 1904).

OTHER TERATOLOGICAL NOTES

By S. B. Parish

1. *Foliar fission in Polystichum munitum.* — A plant of this fern, growing in the San Bernardino Mountains, exhibited in its different fronds a wide range in the extent to which they were affected by fission. This was very slight in some, but in others the normal form of the pinnae was greatly modified. The accompanying figure, from a drawing by Mrs. C. M. Wilder, renders further description unnecessary.

2. *Polyphylly of the Gynecium in Washingtonia.* — The ovary of *Washingtonia* consists of three conjoined carpels uniting in a common style. In a flower of *W. gracilis* two such ovaries, entirely distinct throughout, were included in the same calyx.

This organ was consequently oblong in section, instead of circular, and it was irregularly 6-lobed in place of 3-lobed. The petals and stamens were broken off, so that their number could not be certainly ascertained, but apparently it was not augmented.

Foliar fission in *Polystichum munitum*.

The same monstrosity is common in southern California in budded peaches. As many as half the flowers on a tree may exhibit an increase in the number of pistils. Usually there are

two, but not seldom three, four, or five in number. In most instances but one matures. In these trees the petals are much reduced. In unbudded trees, which bear flowers having well developed petals, I have not observed this deformity.

3. *Syncarpy.* — Two flat, disc-like fruits of summer squash were united at the edges for the distance of about two inches, and thence by a narrow process running to the base. The two fruits were fully grown, and of equal size.

Syncarpy also occurs in the peach, but is confined, so far as I have observed, to the fusion of but two carpels. The sarcocarps are only imperfectly fused, being more or less separated by epidermis, although the general outline may be regular. The two putamens are united by their margins below, and are separate and divergent above. The seeds and seed-cavities are unconnected. This also has been observed only in budded fruit.

4. *Floral Deformations in Lepidium Menziesii.* — In each of two specimens of this plant, collected in the San Bernardino Mountains, the following deformations were present:

Some short branches terminated in naked condensed clusters of imperfect flowers, resembling minute cauliflower heads.

Other stems bore more diffuse clusters of fewer flowers, which were composed of organs resembling the filaments of stamens, destitute of anthers. These were white in color, indefinite in number, but mostly more numerous than the sum of the members of a perfect flower. Some were naked; others had small foliaceous green sepals, and these again were elongated and bract-like.

Below these terminal clusters the stems bore pedicellate flowers, as in normal plants, and of about the ordinary size, but also variously deformed. The two outer floral cycles were green and foliaceous. Some were oval and concave, the inner (petals) purple-margined; others were linear, or linear-spatulate, and up to 3 mm. long. In these flowers the inner cycles were either entirely wanting, or were represented by clusters of filaments, either sessile or elevated on a short prolongation of the axis; or they contained antheriferous stamens, the anther cells sometimes separated, or stamens which were more or less foliaceous.

Again, the stamens were entirely aborted, but the carpels were present, and then these were raised on a stipe, simulating the Capparidaceae. These carpels were short-clavate, divided nearly to the base, but not crested, two-celled, and infertile. Or the pistil was represented by a pair of opposed, separated, linear leaves, as much as 3–4 mm. long; or a pair of oblong, concave, foliaceous organs inclosing a pair of shorter linear leaves. In the last case the outer pair of leaves probably represent the capsule and the inner pair the seeds.

San Bernardino, California.

Britton's North American Trees*

This large volume is one of the numbers of the American Science Series that is being brought out by the publishers. The purpose of this new series is so commendable that a knowledge of it should be widely disseminated and brought to the attention of the American people generally. It is designed to produce a series of books that will make clear to those unacquainted with nature not only living things but at the same time give them an insight into the significance of their forms, their adaptive features and their relation to the environment. The scope of the series is indicated by such divisions as the following: I. Classification of Nature, II. Functions of Nature, III. Realms of Nature, IV. Working with Nature; V. Man in Nature and Evolution.

The Trees of North America comes under the first division in which group work of a similar character upon fishes, insects, seedless plants, mammals, and birds have already been issued.

In the volume under consideration attention is given to all trees growing independently of planting in North America, north of the West Indies and Mexico. Each species is illustrated by figures showing the important characteristics of the leaves, flowers, and fruit, by which they may be identified. A very considerable number of photogravures has been added to the above-mentioned illustrations showing the general appearance or habit of certain

* Britton, Nathaniel Lord, with the assistance of John Adolph Shafer. North American Trees. Large 8vo. x + 894. *f. 1–781.* 1908. New York. Henry Holt and Company. $7.

forms and also often revealing the associations and conditions under which these species live. These photographs for the most part are of exceptional excellence and their reproduction and printing represent the perfection of a most difficult feature of the book-making art. It is a great satisfaction to take up a book in which the details of a photograph have been brought out without recourse to the use of heavy, perishable, and glaring paper. Note should also be made of the line-work figures; especially those illustrating the cone-bearing trees which have been executed with unusual accuracy and skill.

The chief interest in the work is of course centered in the treatment that is accorded the 871 species that make up the body of the text. For clearness and simplicity of statement, for concise and logical presentation, these descriptions and discussions of the North American trees may be well taken as a model by future workers. While the characterization of the forms has been taken up in such a non-technical way as to make the work available to those not trained in botany, this treatment has not resulted in a superficial discussion. The work is thoroughly scientific and the botanist as well as the novice in the subject are alike indebted to the authors for this excellent presentation. The descriptions are very complete, consideration being given not only to the summer and winter appearance of the plant but a great deal of attention is devoted also to the distribution, habitat, and relationship of the native and naturalized trees to those of other countries. Consideration is given also to the physical properties of the wood and to its uses as well as to the various products that are of commercial importance in the arts, sciences, and in various industries. Very timely is the information given regarding the availability of various species for decorative purposes and landscape effects. It is very remarkable that American trees and shrubs have never received the attention in this respect that they deserve. We are constantly confronted in the public parks and private estates with European plants that could often be replaced with advantage by native species. It is encouraging that a few of our horticulturists are realizing the possibilities of this line of work and we feel sure that the North

American Trees will be instrumental in bringing about a wider cultivation of many of our native species.

A very valuable feature of the text that appears quite independent of the descriptions of the plants is the emphasis that is given to the salient and diagnostic characters by which they are readily known. This kind of assistance is of the highest value to the beginner and it would have been greatly appreciated if the features that really identify a form had been emphasized for every troublesome species. Very familiar forms like the red and the gray oak (*Quercus borealis*), the sugar and the black maple (*Acer nigrum*), or the shagbark hickory (*Hicoria ovata*) cause no end of confusion to the beginner owing to their variations. And, after all, how many characters are really used in distinguishing one species from another? A detailed description is of course a necessity but to the mind of the inexperienced it furnishes no distinct picture of the object and consequently a few words to focus his attention upon the most important features are of great assistance.

No one can use the book without experiencing the hope that the authors may put forth a companion work upon the North American shrubs. The need of such a book is constantly brought to the attention of the reader because the authors are often obliged to consider forms that are popularly looked upon as belonging to that imaginary group called shrubs — indeed it is not clear why several forms have been apparently discriminated against and excluded from a place in the book, especially some of the species occurring in the alder, wax-myrtle, cornel, elderberry, and viburnum genera. Probably because it is impossible to draw the line between trees and shrubs. Abridged, pocket editions of these books, somewhat after the plan of the little German guide-books, would meet a long felt want and would be immensely popular. Complaints are often heard of the lack of interest in botany in the United States, but we never stop to consider how little has been done for those who are not somewhat familiar with the subject. The great majority of the books upon botany are of no service to the untrained and this applies to many of the so-called popular works, owing to their fragmentary

and empirical character. A series of small books upon the trees, shrubs, and herbaceous plants, and upon the ferns, mosses, hepatics, fungi, lichens, etc., would be of the greatest service in arousing interest in botany and do more to further its advancement, we believe, than is being accomplished to-day by the schools and numerous publications.

The number of tropical and subtropical trees occurring within the range covered by the book is remarkable. These forms are becoming somewhat familiar to us through their cultivation in greenhouses and their utilization in other ways; and it is indeed a great service to make their identification and interesting features readily accessible. Several desirable changes have been made in the scientific and common names; mention may be made by way of illustration of the substitution of *Magnolia grandiflora* for *M. foetida* and of the separation of the flowering dogwoods, under the generic name, *Cynoxylon*, from the cornels. Whatever may be the laws governing such matters it will be a satisfaction to use an appropriate name for the attractive and fragrant great laurel magnolia and to give generic rank to so distinctive forms as our dogwoods.

The book is provided with a complete index and glossary, and an excellent series of keys, running the forms out to families, genera, and species. These features are of great service and will widely extend its usefulness and make it indispensable as a work of reference.

CARLTON C. CURTIS.

COLUMBIA UNIVERSITY.

PROCEEDINGS OF THE CLUB

APRIL 29, 1908

The meeting was called to order at 3:45 P. M. by Vice-president John Hendley Barnhart. Fourteen persons were present.

The following abstracts were submitted by the authors of the papers presented:

"The Boleti of the Frost Herbarium," by Dr. William Alphonso Murrill.

This paper will shortly be published in full in one of the periodicals of the Club.

"Suggestions for Future Work on the Flowering Plants of the Local Flora," by Dr. Roland M. Harper, chairman of the Phanerogamic Division of the Committee on the Local Flora.*

"Exhibition of Specimens Recently Collected in Jamaica, with Remarks," by Dr. N. L. Britton.

A specimen was exhibited of the nest of the Jamaica swift made from the downy seeds of species of *Tillandsia*, and presented to the New York Botanical Garden by F. B. Sturridge, Esq., of Union Hill, Moneague, Jamaica.

Fruits were also shown of the Jamaican species of *Hernandia*, preserved in formalin, together with herbarium specimens from the same tree, found by Mr. William Harris and myself on the wooded hill near Dolphin Head, a mountain near the western end of Jamaica, and collected March 21, 1908. This tree is one of the largest of the Jamaican forests and apparently either very rare or very local in its distribution. It attains a height of at least 30 meters and a trunk diameter of over a meter. It has not been very definitely known to botanists, inasmuch as Patrick Browne in the "Civil and Natural History of Jamaica," published in 1756, knew of its occurrence there only by rumor, and it is not recorded for Jamaica by Grisebach in the "Flora of the British West Indian Islands." In the treatment of the genus in De Candolle's "Prodromus," Meissner attributes it to Jamaica on the authority of Patrick Browne, but Mr. Harris, in his extensive exploration of the forests of the island, had not been able to find much of it until this discovery near Dolphin Head, where a tree some 20 meters high was cut down and fine fruiting specimens obtained. An examination of these specimens in comparison with those of the other species indicates that the Jamaican tree differs from those of the other West Indies and of the East Indies, and should be defined as a species new to science.

C. Stuart Gager,
Secretary.

* Editor's Note. — This paper is published in full in the present issue and the abstract is therefore omitted.

MAY 27, 1908

The Club was called to order at the Museum Building of the New York Botanical Garden at 4 P. M. by Vice-President John Hendley Barnhart. Eight persons were present. After the reading and approval of the minutes for May 12, 1908, the announced scientific program was presented. The following abstracts were prepared by the authors of the papers:

"The North American Species of *Zygodon*," by Mrs. N. L. Britton.

Attention was called to the fact that *Zygodon viridissimus* is a rare species, having been found only a few times in the high mountains of the southern Alleghanies and northern New York. It is usually sterile and propagates by septate brood-bodies, borne in clusters in the axils of the leaves. Fruiting specimens, collected by Dr. J. K. Small on the summit of White Top, Virginia, showed that the peristome is absent, though all the capsules found were either too young or too old for satisfactory determination. A comparison with specimens collected by Drummond near Hudson Bay show that the latter belong to *Zygodon rupestris* which is variously placed by European authors, either as a species or a variety of *Z. viridissimus*. Sterile specimens of *Zygodon gracilis* have been recently discovered in North Carolina by Dr. A. J. Grout. *Zygodon excelsus*, whose fruit is also still unknown, appears to be more closely related to *Leptodontium* than to *Zygodon*.

"The Acceleration of Senescence by Radium-Rays," by C. Stuart Gager.

In view of the fact already well known, that, as old age approaches, the size of the cell-nucleus, becomes less relative to that of the cell, measurements were made to see if this relation was affected by exposure to radium rays. It was found that in cells near the root-tip of *Zea mays* the diameter of the nucleus was 35.5 per cent. that of the cells, in unexposed plants, but only 33.33 per cent. in roots exposed to radium rays. This is some evidence that exposure to radium rays accelerates the approach of the period of senesence.

"A Collection of Philippine Fungi," by W. A. Murrill.

A splendid collection of fungi, six hundred and thirty-seven packets in all, were recently received from the Bureau of Science, Manila, through Mr. E. D. Merrill, Botanist. Previous work upon the fungi of this region was briefly sketched, and the collections of Philippine fungi in various institutions compared.

This paper will be published in full, with notes and descriptions of interesting species, in a future number of the *Bulletin* of the Torrey Botanical Club.

An announced paper on "Botanical Supplies in the Public Schools," was not given on account of Dr. Hollick's unavoidable absence.

At the close of the stated program, Dr. Gager exhibited some photographs of flowers, etc. taken in natural color at the New York Botanical Garden by the Lumière process. The process was briefly explained.

Dr. Murrill exhibited a specimen of "Tuckahoe," and called attention to the fact that the sporophore of a *Polyporus* had been obtained from a form common in parts of Canada, the "Tuckahoe" being a sclerotium, or a resting stage of the mycelium in mass. He would be glad to receive specimens of these sclerotia, either fresh or dried, from any locality, so that the various species, if more than one exists in this country, may be properly distinguished.

Dr. Barnhart exhibited for Mr. Nash a flowering specimen of the lace-bark tree, *Lagetta Lintearia*, a native of the West Indies. This tree is known to have flowered only once before in cultivation. An article on the specimen, and the peculiarities and uses of the lace-like bark will appear in the June, 1908, number of the Journal of the New York Botanical Garden.

Adjournment was at 4:50 o'clock.

C. Stuart Gager,
Secretary.

OF INTEREST TO TEACHERS

BIOLOGY IN HIGH SCHOOLS*

By Julius Nelson

The word "biology" is here used to include botany, zoōlogy, and physiology, under one term. These three sciences are closely interrelated: it is recognized that zoōlogy and physiology are best taught together; so also it may be noted that the course called "general biology" embraces an alternate comparison between vegetable and animal forms. Zoōlogy and botany may advantageously be studied thus intermixed, because, first, the chemical and physical forces are common to all the kingdoms of nature; second, because of the ecological interactions between the two organic kingdoms as illustrated by parasitism, symbiosis, fertilization of flowers by insects, food relations, etc.; thirdly, seasonal changes affect both plant and animal life, calling for a study of both kingdoms throughout the year.

On the other hand, from the systematic point of view, it is as convenient to take botany and zoōlogy separately and successively, as it is to consider the classes of animals in definite order. There are other reasons in favor of studying a particular branch of biology during a definite period.

There should be no question as to the propriety of including biology in the high school curriculum. As one at least of the three branches of biology has been taught in a large proportion of the high schools for an indefinite period of years, we should not be charged with trying to crowd a "new fangled fad" into an already overcrowded curriculum.

So far as biology replaces physiology, botany, and zoōlogy and is given only the time of a single study, the result may be to reduce the time given to biological study, a reduction to be deplored, for never even under the most favorable circumstances, have these subjects been granted their due proportion of time in comparison with other subjects. The three R's are taught *daily* from the kindergarten to the college sophomore year, yet the fear is often expressed that the fundamentals of education are endangered

* An address delivered before the New Jersey Science Teachers Association at Newark, New Jersey, May 23, 1908.

by the encroachments of such hobbies of the faddists as "nature-study," "agriculture," "biology," and an indefinite number of other "ologies." So far as this fear is well founded the attempt to replace three of the "ologies" by a single one, should be welcomed. Yet this does not seem to meet the pedagogic ideals of educators on the one hand, nor of business men on the other. These are gravely asking what benefit comes from a study of natural science? Does it induce to efficiency? Does it confer mental training and power? Does it equip the student with the tools whereby he can win success in business competition? And if natural science be admitted into the general curriculum, why *biology*, rather than physics or chemistry? Is not biology a technical subject fit only for those who are to enter the medical profession? Do not physics and chemistry underlie biology whereas no knowledge of biology is needed for the study of the physical sciences?

It is not my purpose to answer these questions, they have been ably answered by others, such as Lloyd, Bigelow, and Hodge. We are convinced that biology should form an essential part of a common school education and we call attention to tendencies operating against this.

College entrance requirements determine to a large degree the contents of the high school curriculum. But the college has practically abandoned the old time "general course" which included a considerable list of the natural sciences. The present ideal is the "technical" course, fitting the graduate for a particular business, and including only the studies that most directly bear on the aim of the course. Biology is retained practically only in the courses leading to medicine or to agriculture. Physics and chemistry underlie most technical courses, therefore the college requires the physical rather than the biological sciences as preparatory for entrance. In regard to the classical and literary courses, the so-called "culture" courses, the case is no better, for in these, the "sciences" are offered as "electives" that may or may not be chosen. The classical courses are in fact as highly technical as any course by specializing in language-training, so useful to preachers and lawyers. Conditions that

favor the special course, operate also in the high school. There are the "classical" and the "scientific" courses, preparatory for college. As the majority of its graduates do not enter college, it is urged that such should not be compelled to take these preparatory courses, but for them should be provided suitable courses fitting for business, teaching, etc.; the ideal is the *special*, rather than the *general* course. In a normal course some biological study has generally been included, not as an essential educational element, but because the teacher anticipates the possibility that he may be required to teach the subject. In the training of teachers for special lines, biology is naturally excluded; and unless biology be established as an essential part of secondary education, there will be a decreasing number of general teachers prepared to teach this subject. Perhaps most of the educated men of yesterday had studied some biology though but a mere smattering of antiquated rudiments; to-day, very few of our educated men have received even that much. This is the more remarkable in view of the recent wonderful development of this science, and the increasing rate at which biological problems are pressing into public interest in directions both practical and theoretical. The air is full of biologic lore though mostly false, inadequate, and distorted. Our newspapers have it in the editorial, in the advertizing, and the reportorial column. A biological basis underlies half the utterances of the pulpit. Questions of public policy involving ventilation, disinfection, quarantine, pure food, alcohol, athletics, protection of birds, and of forests, destruction of insects, eradication of tuberculosis, etc. envelope us as an atmosphere; yet the principles involved, are considered expert knowledge, just as in olden days the average man had to hire his reading and writing done for him.

If any one doubts the statement that our educational ideals are against including biology as an essential of a general education, let him try to have biology substituted for even so small a part as one tenth of the time devoted to Mathematics, English, Greek, Latin, or German, in our educational institutions. The time given to the so-called "humanities," has been increased by borrowing from scientific subjects, and often actually excluding biology.

While this retrograde movement has progressed in the higher education, a counter movement has arisen for the introduction of "nature study" into the earlier years of the common schools. Biology necessarily is the principal content of Nature Study. If such study does not interfere with the preparation to meet the requirements for promotion to higher grades, there is hope for the success of the movement, and so in time, everybody will be given a kindergarten knowledge of biology. But is this amount of knowledge sufficient for a full and perfect living?

It is a trite saying that education has a two-fold aim, viz.: the training of faculties, and the acquisition of truth. We have other faculties than those involved in the three R's; and there is truth outside the so-called "humanities." The objective world of nature incarnates at least one half of truth.

Nature is not a disagreeable prison house to be shunned but it is the handiwork of the Almighty — the macrocosm out of which Man the microcosm has been evolved, to reflect the image of God. The natural sciences may properly be contrasted with the "humanities" by being called the "divinities"; a man has only a one-sided education who has not studied both.

Such a symmetrical education should be provided as a "general course" lying as a foundation for all special courses. Such a course has been crowded out of the college; it must find place in the high school, where it should be nourished and defended, as the fruiting of the common course of the lower grades. The high school is the *people's college*. We should substitute for the old three-legged-stool ideal of education, called the three R's a broad, up-to-date, common, intellectual bond for all mankind. Such a course should consist of equal proportions of six subjects; and the school day should be divided into six equal periods to accommodate them: viz., language, mathematics, manual training, history, geography, and art training (or ethics). Political geography is best studied with history; but geography as "the description of the world" means nature study, or the natural sciences.

Nature always presents itself as a complex unit to be analyzed, and therefore the earlier study of nature should be general and

superficial; the study of special branches of science begins with the first year of the high school, when physical geography or physiography may be begun, and in the spring the attention may be given to the unfolding vegetation. Next autumn the plant and insect world can be considered in their interrelations. When the leaves fall, comparative anatomy and general physiology, that is, "zoölogy" may be studied, taking up the development of the hen's egg in the spring and making comparison with the developing eggs of the frog and of insects. The third year may be devoted to physics and the fourth to chemistry; but these sciences have their highest applications in physiology, and the best reason that can be given for their study is that they make it possible for us to understand physiology. Hence I would combine physiology with them. Yet so interrelated are all departments of knowledge that it becomes easy and proper to include natural science in general and biology in particular in much of the work of the other hours of the school day. Under history will be included the biographies of the scientists and the history of science, as well as much of anthropology. Under language will come not only readings in scientific English but also in scientific German. Under art will be included drawings of living models. Under manual training will be included not only writing but school gardening and practical agriculture, also wood working, etc. Even mathematics should be extended to the solution of problems in physics, chemistry, biology, physiology, etc. In this way the student realizes that knowledge is compactly knit together, as an organized unity. And this is the most cogent reason why all men should have a general training. Special training can be offered in various directions, not by exclusion of any one of the six fundamentals, but by varying the proportion between the branches that belong in each. Thus in a classical course, the language hour can be devoted to Greek or Latin rather than to French or German. In the business course, the mathematical hour can be devoted to business arithmetic. In a similar way we can have as many special courses as we desire without narrowing the foundation.

RUTGERS COLLEGE.

The *Bulletin* of the Torrey Botanical Club for May, contained an article by Professor John W. Harshberger on the water-storing tubers found on *Asparagus Sprengeri*, and on two species of ferns, *Nephrolepis cordifolia* and *N. davallioides.* Fresh tubers were tested microchemically for various food substances; the results indicated that water storage is their principal function.

In this period of too rapid utilization of our forest products it is a relief to hear from the Forest Service that "on the Pacific coast, especially in Oregon and California, there is an immense amount of white fir (*Abies concolor*) timber now going to waste for lack of some commercially profitable means of disposing of it. At present it is very little used for lumber, and since it is not cut to any extent its proportion in the forest tends to increase at the expense of other and more valuable trees. Experiments conducted at the Forest Service laboratory at Washington show that this wood is admirably adapted for the production of paper pulp by the sulphite process. It is also claimed that, so far as the product is concerned, the manufacture of fiber from white fir would be a commercial success and that the fiber produced would find its greatest usefulness in the production of manilas, where great strength is required, and in tissues which need very long fibers. It seems probable, also, that it would make very good newspapers, for which purpose its naturally light color would particularly adapt it.

NEWS ITEMS

Mr. David Day Whitney has been appointed instructor in biology at Wesleyan University.

Mr. Harry L. Wieman has been made instructor in biology at the University of Cincinnati.

Professor Frank Lewis Rainey, of Parsons College, Iowa, has been appointed as professor of biology in Central University, Kentucky.

Edward W. Berry, of the Johns Hopkins University, has been appointed American editor for Paleobotany on the Botanisches Centralblatt.

Mr. William Bateson, F.R.S., who recently lectured on heredity in this country, has been elected to the chair of biology at Cambridge University.

At Western Reserve University, Mr. Carl Byron James has been made assistant professor of biology in Adelbert College and the College for Women.

Mr. Martin J. Iorns, horticulturist at the Experiment Station, Mayaguez, P. R., has gone to Cuba and Florida to investigate the citrus and pineapple industries.

Dr. Henrietta E. Hooker has resigned her position as head of the department of botany, having been thirty-five years in the service of the college. She will be succeeded by Associate Professor Mary E. Kennedy.

Mr. L. W. Hawley, expert on wood distillation for the Forest Service, has left Washington for Oregon, Washington, Montana, and Idaho, to investigate the possibilities of a future turpentine industry in the northwestern portion of the United States.

The Sheffield Scientific School of Yale University has purchased a site at the end of Rocky Beach off Bradley Point, Savin Rock, on which an experiment and collecting station will be erected. The building is intended for use during the college year when the Marine Biological Laboratory at Woods Hole is not accessible.

King Victor Emmanuel, of Italy, has erected a palace for the International Institute of Agriculture. Mr. David Lubin, of San Francisco, was the originator of the idea and a prominent delegate at the dedication. Although the many proposed activities of the Institute are chiefly social and economic, they are to be based upon strictly scientific investigation, and the reports, such as warnings of the appearance of new plant and animal diseases, will be of distinct value to science.

TORREYA

August, 1908

Vol. 8. No. 8.

A STUDY OF THE DIGESTIVE POWER OF SARRACENIA PURPUREA

By Winifred J. Robinson

Introduction

The family Sarraceniaceae consists of three genera, two of which are each represented by a single species, *Heliamphora*, collected in Guiana by Schomburgk and Im Thurm, and *Darlingtonia*, which grows in the mountains of California, while *Sarracenia* has seven species described for eastern North America (Macfarlane, in Engler, Pflanzenreich (Heft 34) **4**^{110}: 24. 1908). Natural hybrids have been observed by Harper (Bull. Torrey Club **30**: 332. 1903; **33**: 236. 1906) and Macfarlane (*l. c.* 21) and numerous artificial hybrids have been produced by horticulturalists. All members of the family are native to sunny bogs where their pitchered leaves appear in rosettes from the center of which the flowers arise.

The leaves of *Sarracenia purpurea* are trumpet-shaped with a ventral wing and a terminal lid or lamina (FIG. 1*a*). The outer surface has short, blunt, upwardly directed hairs, cells with the wavy outline of ordinary epidermal cells, and numerous stomata. The inner surface of the terminal portion, or lamina, the "attractive surface" according to Hooker (Nature **10**: 369. 1874) is covered with stiff, reflexed, whitish hairs, the surface of which is corrugated. These contained, in the specimens examined by the writer, a colorless or pinkish fluid with vacuoles, though Vogt (Sitzungsb. Akad. Wiss. Wien **50**: 281. 1864) stated that he found no solid or liquid contents in them but that they were filled with air, and Wunschmann (E. & P. Nat. Pflanzenfam. **3**^{2}: 352. 1891) speaks of them as filled with air. At the entrance to the

[No. 7, Vol. 8, of Torreya, comprising pages 153-180, was issued July 29, 1908.]

pitcher cavity the hairs cease and a smooth area succeeds, due to the somewhat papillate form of the epidermal cells, which was termed by Hooker the "conducting zone" (FIG. 1*b*). The walls are strongly cuticularized, especially in the rolling margin between the inner and outer surfaces of the pitcher. Below this is a glabrous area, the "glandular zone" (FIG. 1*c*), and at the base of the pitcher is a region which bears long needle-like hairs, the "detentive surface" (FIG. 1*d*). Each of these areas bears glands except the last. Hooker (*l. c.*) stated that there were no honey-glands in *Sarracenia purpurea*, but Schimper (Bot. Zeit. **40**: 227. 1882) thought from the structure of crystals in the upper part of the leaves which he had dried, as well as from the behavior of insects, that nectar glands occurred in the upper part of the pitcher. Goebel (Pflanzenbiol. Schild. **2**: 90. 1891) also described nectar glands in this area. The discrepancy between these two statements may be explained by the theory which Hooker (*l. c.*) has advanced for other species, that "the saccharine fluid only makes its appearance during one particular period in the life of the pitcher." Macfarlane (Ann. Bot. **7**: 407. 1893) says that the protective winter bud-leaves show many honey-glands particularly on the outer surface.

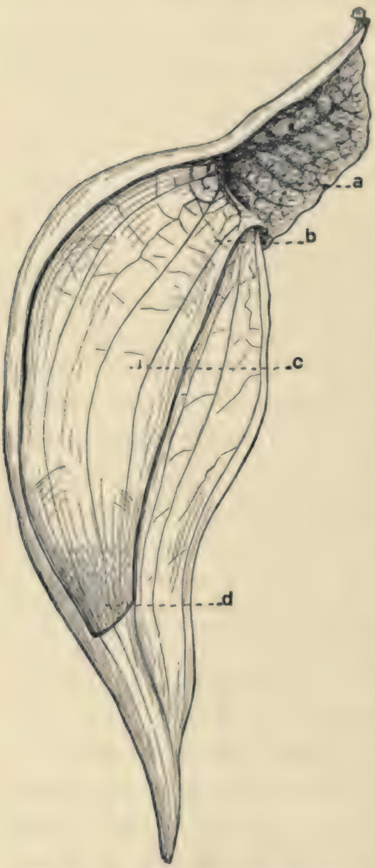


FIG. 1. Leaf of *Sarracenia purpurea* with a portion of the pitcher cut away to show the areas described by Hooker as (*a*) the "attractive surface," (*b*) "conducting zone," (*c*) "glandular -zone," and (*d*) "detentive surface."

St. Hilaire (Morphol. Veg. 142. 1840) and Duchartre (Elem. Bot. 308. 1867) regarded the leaf as a pitchered petiole with a lid which represents the true leaf. Baillon (Compt. Rend. **71**: 639. 1870) compared it to a peltate Nelumbian leaf and interpreted the lower part as the petiole, the pitcher with its wing as corresponding to a ridge on the outer base of peltate leaves of certain Nymphaeaceae, while the lid represents a terminal lobe. Asa Gray described the pitcher as a phyllodium, the terminal lid as the blade of the leaf. Macfarlane (Ann. Bot. **3**: 264. 1889) describes it as the hollowed-out upper part of the midrib "in front of which two elongated green leaflets have fused, producing a prominent wing, a dorsal continuation of the pitchered midrib in flattened form which gives off on either side two leaflets, the whole constituting the lid." He bases this theory largely upon the arrangement of the vascular bundles, which are in two parallel rows with their xylem portions facing each other. Goebel (*l. c.* **2**: 76. 1891) criticizes this view, saying that the primordium of the leaf resembles that of bud-scales with no differentiation into petiole and blade. He regards the lid and pitcher both as parts of the structure termed lamina in the ordinary type of leaf. Bower (Ann. Bot. **4**: 167. 1889) has reviewed the theories of Macfarlane and Goebel and concluded that "the leaf of *Sarracenia* is a simple phyllopodium, consisting of (1) a basal sheathing portion, (2) a middle portion which may be hollowed by involution of the upper surface, and bear upon its upper surface a phyllodineous flap, and (3) the lid which is the simple, flattened termination of the leaf."

The leaves of seedlings, with the exception of the cotyledons, develop as pitchers in all the species that have been examined. Shreve (Bot. Gaz. **42**: 118. 1906) describes the development of seedling leaves of *S. purpurea* as follows: "The first epicotyledonary leaf arises opposite the interval between the cotyledons. It is finger-shaped with a somewhat broadened base. On reaching a length about twice its diameter there begins a rapid lateral outgrowth of the tissue of an O-shaped area on the side of the leaf rudiment which faces the growing point, giving rise to a pit which is destined to become the cavity of the pitchered leaf.

The basal part of the O-shaped outgrowth now begins to grow upward, in which it is accompanied at the same rate by the upper portion of the O, which at the same time carries forward the apical growth of the leaf. The cavity of the pitcher thus grows in depth by the upward growth of the tissue by which it is surrounded. The bottom of the cavity is subsequently elevated by the further growth of the tissue beneath it."

Plants of *S. purpurea* kept under glass for a year at the New York Botanical Garden showed a marked tendency to form blade-like structures instead of ascidial leaves. Goebel (*l. c.* 73) describes in several species this tendency to produce leaves without pitchers at the close of the vegetative period.

The peculiar form of the leaves of *Sarracenia* has attracted the attention of the curious ever since their discovery. A specimen of *S. flava* brought to France by a sailor with the legend that it grew on a fragrant Canadian tree was named leaf of the incense tree (*Thuris Limpidi folium*) and figured by de L'Obel (Adversaria 430. 1570). *S. purpurea* was figured and described by Clusius (Hist. Rar. Pl. **4**: 82. 1601) as a plant whose leaves were like the flowers of Aristolochia. He named it *Limonium peregrinum* from its fancied resemblance to sea-lavender (*Limonium carolinianum*). John Josselyn in "New England's Rarities," 1672, describes it as follows: [John Josselyn, New Eng. Rar. (ed. Tuckerman)—(95). 1865] *Hollow Leaved Lavender* is a Plant that grows in salt Marshes overgrown with Moss, with one straight stalk about the bigness of an Oat straw, better than a Cubit high, upon the top standeth one fantastical Flower, the Leaves grow close from the roots, in shape like a Tankard, hollow, tough, and always full of Water; the root is made up of many strings, growing only in the Moss, and not in the Earth, the whole Plant comes to perfection in *August* when it has Leaves, Stalks, and Flowers as red as blood, except the Flower which hath some yellow admixt."

The Indians of southern Minnesota called it ko-ko-moccasin, or owl's moccasin. From the rhizome and young leaves a concoction was made by the Canadian Indians which they believed to be a remedy for small-pox (Millspaugh, Am. Med. Pl. 19–3. 1887). This has been used to a certain extent in homeopathic pharmacy.

Linnaeus (Sp. Pl. 2d. ed. 728. 1763) adopted the name *Sarracenia* given by Tournefort (Inst. **1**: 657. 1700) in honor of Dr. Sarracin, a physician of Quebec, who sent to France the specimen described by him.

The use of the pitchers to the plant has been variously explained. Catesby (Nat. Hist. Car. **2**: 70. 1754) described them as asylums providentially provided for insects, so that they might escape from the frogs which pursue them, but most writers have thought that the advantage was on the side of the plant rather than that of the insect. Linnaeus (Sys. Veg. 491. 1784) described the evolution of the pitchered leaf and its value to the plant thus: "Sic metamorphosis folii Nymphaeae in folium Sarraceniae, ut ipsa aquam pluvialem excipiens et retinens extra aquas crescat; mira naturae providentia!"

Wheeler (Bull. Am. Mus. Nat. Hist. **22**: 415. 1906) records the use of pitchers of *Sarracenia* as nesting places for two species of ants (*Dolichoderus Mariae* and *Tapinoma sessile*), which had not apparently suffered from their surroundings. In the same article he speaks of finding nests of a bog-loving species (*Cremogaster lineolata pilosa*) in old pitchers, the proximity of which to the functional, water-containing pitchers had caused many of the workers to drown in their ascidia. Certain carrion flies are reported to lay their eggs in the debris in the bottom of the pitchers, and the larva of one kind of mosquito is said to develop in them, living in them through the winter.

The color of the old pitchers is usually a dark purplish red, but the young pitchers are light green with a network of red veins if they grow in the open, while shade makes them develop a uniform deep green. This is illustrated in the swamps along the railroad near Lakewood, N. J., where the red of the pitchers in the clearing contrasts with the green of those growing under the cedars (*Juniperus virginiana*). Gies (Jour. N. Y. Bot. Garden **4**: 37. 1903) states that the dilute neutral extract of the leaves of *S. purpurea* is practically colorless, an acid extract is crimson, and an alkaline solution, green. He has given the name alkaverdin to the pigment because of the beautiful green color produced by the addition of an alkali. It has a superficial re-

semblance to the coloring matter of the elderberry and red cabbage, but is unlike them in fundamental chemical characters. The aqueous extract is dextrorotary, reducing, and fermentable. Husemann (Pflanzenstoffe 107. 1871) describes an alkaloid called sarracin in the form of needle-like crystals which can be isolated from the rootstock.

Schimper, in 1882 (Bot. Zeit. **40** : 226. 1882) made digestion experiments upon plants of *S. purpurea* which were growing wild in the Massachusetts bogs. Some of his observations were made upon insects caught by the plants, and some upon pieces of meat that had been placed upon the leaves. He found that on closing the pitcher with tissue paper at the time of opening and thus preventing the free entrance of bacteria the digestion took place no more quickly than in water outside the plant.

Goebel's (*l. c.* 167) experiments were conducted upon plants under cultivation. The pitchers were filled to within 10 cm. of the top, and closed with a cork covered with paraffin. The height of the fluid was measured by a strip of paper fastened on the outside of the pitcher. After 48 hours the following observations were made : The fluid in the pitcher containing 1.0 per cent. formic acid in which fibrin previously swollen had been placed, was lowered 6.8 cm.; the remaining liquid was acid, the fibrin was not attacked. Water in another pitcher was reduced from 10 cm. to 8 cm. by absorption. Meat-extract neutralized with sodium hydroxide was reduced from 10 cm. to 7.5 cm. The meat-extract was full of bacteria, turbid, and alkaline in reaction. A piece of meat the size of a pea was placed with water to a height of 10 cm. in a young green pitcher. After 2 days the column was reduced to 8.2 cm., but the meat had scarcely changed though it was covered with bacteria. A small piece of meat was placed in another young pitcher with meat-extract. After 3 days the meat had a bad odor, but not as unpleasant as that of the control, and it eliminated ammonia.

From the results of these experiments Goebel concluded that *Sarracenia* had no protein dissolving enzyme or antiseptic substance and that the inner surface of the pitcher, especially the lower part, could absorb water and dissolved substances.

Experiments

The present series of experiments was undertaken under the direction of Professor William J. Gies, at the New York Botanical Garden, in the summer and autumn of 1907, in order to determine especially the digestive power of *Sarracenia purpurea* on carbohydrates, fats, and proteins.

The plants were obtained from the sphagnum bogs near Lakewood, N. J., and from a similar locality near Poughkeepsie, N. Y. No difference was observed in the behavior of the plants from the two localities. They were planted in sphagnum and kept in the propagating houses of the New York Botanical Garden under as nearly natural conditions of temperature and moisture as possible. Before a solution was placed in a pitcher the contents were withdrawn by means of a pipette, the pitcher was thoroughly, though gently rinsed with tap-water and distilled water, and swabbed with absorbent cotton. After the solution had been placed in the pitcher, it was covered with lace net which proved effectual in preventing the entrance of insects except during the use of olive oil, which was so attractive to ants that it was necessary to set the crocks containing the plants used for those experiments in dishes containing water to keep the ants out. The materials used in the protein tests were prepared under Professor Gies's personal supervision and great care was taken in handling the others.

Tests were made of the effects of various solutions with the special purpose of providing helpful information for use in the subsequent digestive work.

I. Effects of Various Solutions

Acetic Acid.—A 0.5 per cent. solution of acetic acid was found to be injurious. Pitchers containing it began to wither above the level of the liquid within a few hours, and were dead at the end of six days.

Potassium Nitrate.—A dilute solution of potassium nitrate ($m/1024$) proved harmless, though by frequent renewals it was kept in the pitchers a period of six weeks. A 0.5 per cent. solution of potassium nitrate was not injurious. In one case per-

ceptible growth occurred in its presence, but a 1 per cent. solution caused pitchers to wither in six days, while a 2 per cent. solution made them brown and dry in three days. Both young and matured pitchers were used for this experiment but the results were the same in either case.

Sachs's Nutrient Solution. — A nutrient solution such as that commonly used as a water culture for flowering plants (per 6,000 c.c.: $CaNO_3$, 6.0 gr.; KNO_3, 1.5 gr.; K_2HPO_4, 1.5 gr.; $MgSO_4$, 1.5 gr.; $FeSO_4$, a trace) was placed in pitchers, and caused them to begin to decay within a few days, the tissues being entirely dead in from two to three weeks.

Liebig's Meat Extract. — The effect of a stimulant was tested by means of a dilute solution of Liebig's meat extract. Bacteria and infusoria developed in great numbers, however, and the pitcher began to wither in less than a week, becoming entirely decayed in about two weeks.

Milk. — A solution of milk, one drop in 10 c.c. of distilled water, which was neutral to litmus when placed in the pitcher, gave no odor and no acid reaction with litmus at the end of six days. When the concentration was doubled the solution became acid and the pitcher decayed almost completely in two weeks. A solution of milk, 20 per cent. by volume in distilled water, coagulated and became unpleasant in odor, within two days. It was inferred that the pitcher gave out an alkaline substance which reacted with the acid produced in the very dilute solution of milk but was not sufficient to neutralize the solutions of greater strength. There was nothing to indicate that the milk fat or protein was digested.

Distilled Water. — For comparison with the preceding solutions, distilled water was kept in certain pitchers for a period of about five weeks, by means of frequent renewals. There was no change in the external appearance of the pitchers, which is interesting from the fact that a concentrated solution of sucrose was equally harmless, so that the tissue of the pitcher is able to adapt itself to solutions widely different in osmotic strength.

The following solutions were also placed in the pitchers of *Nepenthes distillatoria*, the plants being kept in the propagating

houses of the New York Botanical Garden under the same conditions as those of the plants of *Sarracenia*.

Potassium Nitrate.— A dilute solution of potassium nitrate ($m/1024$) proved harmless at the end of nine days as far as could be determined from external appearances, but after twelve days the pitcher began to wither.

Sachs's Nutrient Solution. — *Nepenthes* pitchers were somewhat more resistant to the nutrient solution than those of *Sarracenia*, as the withering of tissues was not apparent until about eight days had elapsed from the time the solution was put into the pitchers.

Liebig's Meat Extract. — *Nepenthes* pitchers proved more resistant to the dilute solution of Liebig's meat extract than *Sarracenia*, as the pitcher contents did not seem foul and the pitchers did not decay during the two weeks which the solution was allowed to remain in them. This may have been due to the digestion of the bacteria by infusoria, which were present in large numbers. Of course it is possible that bacteria were digested by the proteolytic enzyme, nepenthin.

II. Effects on Carbohydrates

Glucose. — A 10 per cent. solution of glucose was placed in pitchers of *Sarracenia* and allowed to remain from four days to three weeks. With Fehling solution they gave the reddish brown coloration promptly in every case, on heating, which indicates that at least some of the glucose remained, although no tests were made to determine the absence of reducing substances that might have been produced from the glucose. The quantity of the latter was naturally diminished by ordinary fermentation. There were no indications of a detrimental influence exerted by any of the fermentation products. The α-naphthol test indicated in each case the presence of much carbohydrate.

Sucrose. — Solutions of cane sugar (sucrose, c.p.) of a very low degree of concentration (less than 1 per cent.) were introduced into the pitchers of *Sarracenia*.

There was no apparent bad effect. Further trials with stronger solutions were made until it was found that a solution of 33⅓

per cent. could be resisted for two months, with no apparent injury to the pitcher. The growth of the young pitchers containing such a solution was equal, so far as it could be measured, to that of pitchers containing water. Solutions of the various strengths were tested with hot Fehling solution after they had been in the pitchers from three to seven days. The contents of each pitcher gave a reddish precipitate of copper oxide, indicating the production of invert sugar. A heavy reduction of Fehling solution also occurred spontaneously without heating although water from the pitchers did not behave in this way.

As checks for this experiment, Fehling solution, as well as Fehling solution with an equal quantity of the stock sugar solution was boiled, but neither gave an indication of reduction.

Starch. — Starch paste was placed in the pitchers and allowed to remain three or four days, in one case as long as thirteen days, when it was removed and tested in the usual way with Fehling solution. The result indicated that a reducing compound, presumably sugar, had been formed, the exact nature of which was not determined however. When Fehling solution was added to starch paste from the pitchers *without boiling*, no reduction occurred, so that the reducing power of the contents was not so marked as in the case of the cane sugar. Tested with iodine, a few blue granules indicated that not all the starch had been hydrated. Toluol sufficient to form a thin film over the top of the fluid in the pitcher was added in some cases but the reduction was the same as in the case of pitchers to which no antiseptic had been added. From this it may be concluded that the change from starch to reducing substance (sugar ?) is due to an enzyme secreted by the cells of the pitcher. There were no indications of fermentation in the pitchers with toluolized contents.

As checks in the experiments on the action of the pitchers upon starch paste, Fehling solution was tested by boiling ; tap-water and Fehling solution were boiled together ; and tap-water which had been in the pitchers for the same length of time and under the same conditions as the starch paste, was boiled with Fehling solution ; also, tap-water to which toluol had been added, and which had been allowed to stand in the pitchers the same

length of time. Samples of the fresh starch paste and of that which had been allowed to stand in a flask near the pitchers, with and without the addition of toluol, were boiled with Fehling solution. In no case was there any reduction, hence the reduction which occurred with the liquid from the pitchers cannot be attributed to impurities in the fluids used in the experiments.

The above carbohydrates were also introduced into the pitchers of *Nepenthes*, with the following results :

A solution of glucose of the same concentration as that used in the pitchers of *Sarracenia* was placed in the pitchers of *Nepenthes* and allowed to remain four days with apparently no harmful effects. The test with Fehling solution resulted positively.

A 10 per cent. solution of cane sugar which had been allowed to stand in the pitchers of *Nepenthes* four days was tested with Fehling solution but failed to manifest reducing power, hence it was inferred that no cane sugar reducing enzyme was present in the contents of the pitchers in this experiment. Probably no such enzyme is normally produced by *Nepenthes*.

Thin starch paste was placed in the pitchers of *Nepenthes* and tested after four days with Fehling solution, but no reduction occurred, which indicates that *Nepenthes* does not give out such a starch splitting enzyme as that secreted by *Sarracenia*. The iodine test showed that the starch granules in the paste had not been broken down.

As these experiments were conducted at the same time as those upon *Sarracenia*, the same checks applied to both, making the results all the more significant.

III. Effects on Fats

Olive Oil.—As a test of the fat-digesting power of *Sarracenia*, washed neutral olive oil, in the proportion of 0.4 c.c. of oil to 9.6 c.c. of distilled water or tap-water was used. The mixture was well shaken immediately before it was introduced into the pitchers. After the mixture had been in the pitcher from four to seven days it was removed and titration was effected by means of phenolphthalein as the indicator, the number of drops of *m*/100 potassium hydroxid solution needed to neutralize a uniform quan-

tity of the fluid being taken as a measure of the lipolytic power of the liquid. The amount of alkali required (except in certain abnormal cases, which were caused by the accidental presence of ants in large numbers and consequent putrefactive lipolysis) was the same as for an identical volume of the liquid which had not been introduced into the pitchers, so it may be inferred that no digestion of the fat occurred.

As a check, a mixture of olive oil and water of the same proportion as that used in the preceding experiments, with the addition of toluol was placed in several pitchers but the amount of alkali necessary to neutralize was so nearly the same in every instance as to indicate that the oil was neutral and that no digestion occurred.

Ethyl Butyrate. — As a further test of the fat digesting power of *Sarracenia*, tap-water which had been left in the pitchers one day was removed and placed in stoppered bottles with ethyl butyrate in the proportion of four drops of the butyrate to 2 c.c. of the pitcher liquid. It was allowed to remain at room temperature twenty-four hours and then titrated, phenolphthalein being used as the indicator and the lipolytic activity of the fluid being measured by the number of drops of $m/100$ sodium hydroxide solution needed to neutralize it. In place of tap-water, a very dilute solution of potassium hydroxide (KOH $m/100$), and also a very dilute solution of acetic acid (KOH $m/100$), was used in testing the contents of certain pitchers, but the number of drops of the alkaline solution needed for neutralization did not indicate any digestion.

As a check the stock liquid which had not been in the pitcher was subjected to the same test as the pitcher contents in each case, and the results were practically the same as with the pitcher fluid.

Olive oil and water, in the same proportions as those used in the case of *Sarracenia*, were placed in the pitchers of *Nepenthes* and the titration process was conducted in the same manner, but no digestion was detected.

The experiment with ethyl butyrate was repeated with the substitution of tap-water which had been in the pitchers of *Nepenthes* instead of *Sarracenia*, one day. No digestion was indicated.

IV. Effects on Protein

Fibrin. — Water which had been left in the pitchers of *Sarracenia* six days was removed and placed in bottles to each of which a granule of fibrin was added. As checks, toluol was added to some of these, dilute acid to others, and dilute alkali to a third set, the acidity or alkalinity being in each case below the harmful point as determined by the earlier experiments. Toluol was added to a portion of the acid and alkaline mixtures. The result was quite uniform, for the fibrin granule remained apparently unchanged in each liquid.

General Conclusions

The results of the above experiments may be summarized as follows:

1. The pitchers of *Sarracenia purpurea* can adapt themselves to solutions of very different osmotic strengths.
2. They give out an enzyme which hydrates sucrose and starch to reducing materials, presumably simple sugars.
3. They have no fat-digesting power.
4. They do not secrete a protein-dissolving enzyme.

In the tests which were made upon the pitchers of *Nepenthes* the resistance to solutions of marked difference in osmotic strength was shown to be the same as in the case of *Sarracenia*. The plants differed in that *Nepenthes* did not give out into the pitcher cavity any enzyme capable of hydrating sugar and starch, whereas *Sarracenia* did. The experiments as to protein digestion in *Nepenthes* were inconclusive, but they were not repeated partly because of insufficient material and partly because the demonstration of the existence of a protein-dissolving enzyme in *Nepenthes* by Vines (Ann. Bot. **12** : 545. 1898) was accepted as final.

Sarracenia purpurea belongs to the class of plants which, like the bromeliads of the tropics or our northern catch-fly, illustrates a mal-adaptation between plants and animals, for while they serve as traps for insects they are neither harmed nor benefited by them, unless the number be very great. In the sphagnum bogs where *Sarracenia* grows, the concentration of salts and nitrogenous matter about its roots is so great as to place them

practically under xerophytic conditions. This would tend to render the root system inefficient as a means of water absorption and make the possession of a water-storing organ like the pitchered leaf of great advantage to the plant.

The epiphyte *Nepenthes* represents the highest degree of adaptation, in that it produces a protein-dissolving enzyme, the nepenthin of Vines (Ann. Bot. **15**: 563. 1901). Even here, however, the absorption of protein by the leaves is not absolutely essential to the life of the plant, though of great advantage. *Nepenthes*, then, stands at the upper limit in the evolution of plants with pitchered leaves, while *Sarracenia purpurea* is near the lower limit. Between them are numerous forms with varying degrees of adaptation.

New York Botanical Garden.

SPECIES AND VARIETIES

By T. D. A. Cockerell

The recent discussions on the species question, particularly that of the Botanical Society, printed in the May number of the American Naturalist, show at least one thing — that the matter may be regarded from very diverse points of view. This being so evident I beg permission to add yet another to the already numerous collection.

Politically, I am an American; but biologically, an Englishman, with many of the idiosyncrasies of that singular race. According to current report, one of the peculiarities of the English is a limited sense of humor. I rather incline to the opinion that this is not wholly to their discredit; but nevertheless, I am far from proposing legislation to prohibit anyone from making a joke unintelligible to the Anglo-Saxon mind. Such restrictions have probably never been contemplated in respect to jokes, but are they not a little like those desired by botanists, who insist that all species must be discernible to general students of plants? Such persons talk about the *creation* of species by botanists, showing thereby, and in other ways, their opinion that species are purely artificial things. Their attitude toward species is something like

that of the legislators who, very properly, enacted laws about the size of the fourpenny loaf. In a certain sense of course they are perfectly right. The term species is applied to a particular kind of thing, not any more definable perhaps, than humor, but about as easily recognizable in the majority of instances. It is not permissible to call anything humor, or species, at random; but it must be recognized that these names do stand for realities, and that in either case these may be genuine enough, and yet overlooked by the majority of persons. If a species were not a real thing, a segregated object related to, but discrete from others such objects in a complex and wonderful world, all our discussion would be relatively meaningless; and those would be right who should urge that we occupy our minds with something more profitable.

While it is doubtless true that every taxonomist has good reason to complain of the conduct of all his colleagues, it seems possible, at least, that much of the lamentation which so frequently falls upon our ears is the result of mere inertia. Take the genus *Crataegus*, cited everywhere as a horrible example. In the old days, *Crataegus* was easy; the "species" were few, and had easily recognizable characters. If we could proceed without taking any account of the facts of nature the old system would have much to commend it — at least for those who prefer uniformity to variety, dullness to incident. We know to-day that American *Crataegus*, like the *Rubus* and *Hieracium* of Europe, is wonderfully polymorphic; and the study of this multitude of stars of the eighth magnitude offers as interesting and profitable work for the evolutionist as he could well desire. I have compared the species of *Crataegus* with minor stars, and the comparison is I think apt. They are separable entities, but of different grade of magnitude from ordinary species; amateur astronomers, as amateur botanists, may from preference or necessity confine their attention to the more visible units; but neither the *science* of astronomy, nor that of botany, has any right to such limitations.

As we gain knowledge, we see more and more clearly that "species" are of various grades and kinds: and it is eminently

desirable to devise a system which shall indicate this diversity. We are not yet prepared, I venture to think, to do this with complete success, but it is one of the necessities of the future ever to be kept in mind. In the meanwhile, any proposal to go back to the old system, and virtually ignore all the wonderful facts of segregation which have been revealed to us in recent years, is simply pernicious.

From the standpoint of convenience and intelligibility, it seems to me that there is much to be gained by the recognition of subspecies, with a trinomial nomenclature. The introduction of a new form as a subspecies when its precise status is uncertain, has at least the advantage of calling attention to its manifest affinities, and suggesting further work to determine the character and extent of the segregation. The proposal to deny subspecific names obligatory priority when the plants they represent are treated as separate species seems to me unfortunate, since it will assuredly have a strong tendency to cause writers to announce their novelties as full species whenever there is any possibility of their proving such, and will place more cautious workers at a disadvantage.

I cannot see much advantage in the proposal to distinguish minor forms or races by numerals. Imagine specific names replaced by numbers! Numbers are not only less interesting than names, but are more easily confused and misprinted, and when errors of this kind are made there is nothing to show what is wrong. Is it fair to hint that this botanical penitentiary-system for minor segregates is desired by those who really wish to relegate these things to comparative obscurity; whereas to some others, —*e. g.* the evolutionist and the horticulturist, they are of prime importance? The system of naming things is not peculiar to science; it is found useful to extend nomenclature as far as human interest can or will follow; thus every individual of *Homo sapiens* has a distinctive name, and if we had the sort of mind which is usually attributed to the deity, I suppose every individual plant would be esteemed worthy of a like distinction. As it is, the real question about races is, are they worth thinking about, talking about, and describing, considering our human limitations? The answer of modern biology surely is, yes!

A code system for parallel modifications seems eminently desirable, but I think it should follow the character of the modification, rather than the cause, the latter being often obscure. To designate a particular form as a "shade form," for instance, seems to me to artificially simplify matters and obscure the actual facts. With shade are usually associated increased moisture and decreased temperature; but in certain places and at certain times, the exact reverse is true. In all this, we come back to the great fact of the complexity of natural phenomena; and while we seek everywhere for general laws and find them in operation, we must not forget the Linnean motto: "Natura maxime miranda est in minimis."

University of Colorado,
Boulder, Colorado.

NOTES ON THE LIFE AND WORK OF CHARLES C. FROST*

By William A. Murrill

Charles Christopher Frost, the "shoemaker botanist" of Brattleboro, Vermont, by integrity and simplicity of life and singleness of purpose in his work and in his recreation amassed a modest fortune and greatly advanced the knowledge of the flora of his native state.

A plain man, of great modesty, he repeatedly declined scientific positions and honors, and stuck to his trade of shoemaking during his entire working life, occupying the same shop for a period of forty-nine years. When asked the reason for this he replied, "Whatever I have acquired of science, in my life, came through search for health and mental entertainment; science is not my profession — shoemaking is." His character was formed along strictly puritanical lines, industry, simplicity, reserve, and deep religious conviction being its prominent characteristics.

Frost's success was due to a splendid intellect and close application. He had no advantages, except those afforded by a small

* Editor's Note. — This article forms an interesting introduction to Dr. Murrill's paper on the *Boleti* of the Frost Herbarium, which is to be published in the *Bulletin*.

village school kept open during the winter months, and this he left in his fifteenth year to help his father in the shop, resolving, however, to set aside for the rest of his life an hour each day for study. Mathematics first absorbed his attention, but a love for the natural sciences was soon acquired and this was fostered by collections of insects, shells, and other natural objects.

He became a botanist through the advice of a noted New York physician, whom he consulted regarding a severe case of dyspepsia with which he was afflicted. The physician frankly told him that he could do nothing for him, but that he could do everything for himself, and suggested that he devote an hour each morning and an hour each afternoon to the observation and study of plants in the field. Following this excellent advice, it was not long before Frost was on the road to health, and also to fame as a botanist. He purchased some botanical works and a good microscope, acquired a knowledge of Latin, French, and German, and devoted practically all of his leisure time henceforth to the study of plants growing wild in the region of Brattleboro. Excursions were often made in the early morning before the shop was opened, and during the day and in the evening he was rarely seen without an open book beside him. Half of the noon hour was regularly spent in the attic with his plants, and most of his microscopic work must have been done at that time. On rare occasions, when Sprague or some other intimate botanical friend paid him a visit of a day or two, the shop would be closed for the entire period; but it was by the faithful and constant use of the leisure moments of a busy life that most of his knowledge was acquired.

Frost's botanical work was done between 1845 and 1875. The published results of this work are very meager, consisting chiefly of catalogues of cryptogamic plants occurring in New England.* The first catalogue contained additions to the fungi

* Further Enumeration of New England Fungi. Proc. Boston Soc. Nat. Hist. 12: 77–81. 1869.

Catalogue of Boleti of New England, with Descriptions of New Species. Bull. Buffalo Soc. Nat. Sci. 2: 100–105. 1874.

A Catalogue of Plants Growing Without Cultivation within Thirty miles of Amherst College. By E. Tuckerman and C. C. Frost, 1875.

previously listed by his friend Sprague, of Boston, who turned over to him his remaining material in 1860 and asked him to continue the work. In the eight years that followed, Frost succeeded in adding 263 species to Sprague's revised list of 678. Only three of these additions were *Boleti*, and two of them were omitted from the Amherst Catalogue, as foreign to New England.

The second publication cited is a list of the 47 species of the genus *Boletus* found in New England, 22 of which were described as new. This is perhaps his most important work, judging from the standpoint of publication, since it contains descriptions, and not names only.

The third catalogue, prepared in collaboration with Tuckerman, is by far the most pretentious of his publications, being a summary of his entire botanical knowledge regarding New England mosses, liverworts, stoneworts, and fungi, so far as this knowledge could be expressed in a mere list of species. The work contains 98 pages, 44 of which are contributed by Frost, 36 of these being devoted to fungi. Under the genus *Boletus*, 46 species are listed, and one species each under *Strobilomyces* and *Fistulina*. Of the 1,190 species of fungi listed, 60 were first described by Frost, 40 of these being *Boleti* and gill-fungi.

In the absence of more extensive and detailed published results, it is no doubt true that Frost's herbarium represents his most valuable botanical work. This was retained by his family for ten years after his death, and then deposited by them, in 1890, with the Natural History Society of Brattleboro for a period of twelve years, when it was decided to transfer the entire collection to the University of Vermont. At that time the number of cryptogams in the collection was estimated at from three to five thousand specimens.

Frost's botanical library, consisting of about 100 bound volumes and various manuscripts and drawings, was also deposited with his herbarium. Among his most helpful books on fungi were some of the works of Berkeley, Cooke, Persoon, Fries, Schweinitz, Rabenhorst, Tuckerman, and Peck. Sprague sent him a number of his pen drawings of Agarics, and he had copies of many colored figures of *Boleti* taken from published illustrations.

The fungi were kept by Frost in paper boxes or glued flat to sheets of blank books. It is said that these were considerably disturbed soon after his death by visiting botanists. A number of the fleshy forms were much injured by mould but none was wholly destroyed, so far as I know. The specimens of *Boleti*, probably the cream of the entire collection, have been most generously placed at my disposal by the university authorities for critical examination, and the results of this study will be published in a short time.

NEW YORK BOTANICAL GARDEN.

REVIEWS

Lewis's Plant Remains of the Scottish Peat Mosses*

This study by F. J. Lewis of the plant remains of the Scottish peat bogs, of which Part 3 dealing with the eastern and northwestern Highlands, Shetland Islands, Outer Hebrides, etc., has just reached this country, is a model in English of the line of work so successfully pursued by Nathorst, Gunnar-Andersson, and others of their countrymen, but published for the most part in Swedish and Danish and consequently inaccessible to most students. While the sequence of events as found by Lewis in Scotland is somewhat variable as would be naturally expected when the varying physical conditions of deposition are taken into account, the general order is sufficiently uniform to enable him to make some very interesting correlations between the different areas.

The following is a somewhat generalized abstract of this march of events in the late Pleistocene: The oldest beds found (exclusive of the rock floor) are glacial sands and till which are referred to the fourth Glacial or Mecklenburgian stage. These are followed by desposits containing arctic plants, indicating tundra conditions. Upon these are superposed the peat deposits of the fourth Interglacial period with *Betula*, *Corylus*, *Potentilla*, *Menyanthes*, *Salix*, etc. This forest bed or scrub is gradually exterminated by *Sphagnum* and the indicated wet moorland condition persists to the fifth

* The Plant Remains in the Scottish Peat Mosses. By F. J. Lewis. Part 1, Trans. Royal Soc. Edinb. 41[3]: 699–724. pl. i–vi. 1905; Part 2, Ibid., 45[2]: 335–360. pl. i–v. 1906. Part 3, Ibid., 46[1]: 33–70. pl. i–iv. 1908.

Glacial or Turbarian stage, represented by mountain glaciers, and arctic valley floras, at least towards its close. These consist largely of the herbaceous arctic willows such as *Salix reticulata* and *herbacea* with *Dryas octopetalata*, etc. The fifth interglacial is marked by a gradual amelioration of temperature, the arctic willows being replaced by a close growth of *Salix arbuscula* with *Potentilla comarum, Empetrum nigrum, Arctostaphylos alpina*, and other sub-arctic forms until finally the moor is converted into a forest with *Betula alba* or *Pinus sylvestris* predominating, the latter with an undergrowth of *Calluna*. These conditions are followed by increasing humidity and precipitation until wet moorland (*Sphagnum*) has replaced the forest and the climate becomes considerably cooler with slight alpine glaciation. Soon, however, the climate becomes warmer, more genial, and drier in fact than it is at the present time, and another forest of *Pinus sylvestris* of large size and with an undergrowth of *Calluna* and some *Corylus* and *Alnus* occupies the region. † Succeeding the pine forests is another era of wet moorlands (*Sphagnum, Scirpus*) which gradually changed to the present somewhat drier condition.

While it is regrettable that all of the plant forms discovered have not been identified and listed and while the manner of presentation is susceptible of improvement, the study as a whole is an extremely valuable one and shows the possibilities in a line of work almost wholly neglected in America. It is to be hoped that it will furnish a stimulus to botanists favorably situated in our own northern states and induce them to get a little way below the surface in their ecological studies.

Edward W. Berry.

Johns Hopkins University.

AN EDITORIAL PLEA

A contemporary magazine writes as follows: We cannot expect the "man who pays" to continue to pay unless he receives value for his money, but the value of a scientific journal, unlike that of a popular magazine, is dependent entirely on gra-

† Proximity to the Atlantic caused the wet moorland to persist in western Scotland at this time.

tuitous contributions. It cannot buy its talent, but must take what material is sent to it.

This plaint must appeal strongly to all editors of scientific journals, but it could truthfully be made more pathetic still; for, while some editors groan because they "must take what material is sent," most editors moan because of the material that is *not* sent.

Several college professors have said that we have no good magazine devoted to general botany which they can recommend to their students. TORREYA, the more popular journal of the Torrey Botanical Club, would gladly enlarge its scope and increase the amount of its printed matter to become such a journal, but the most willing and aspiring editorial board must have material to edit.

The cruse of oil and the handful of meal have been ours — and that without dregs and scrapings — but help is needed from *more* of our club members and subscribers. That would mean a wider range of subjects and a better monthly selection and arrangement. Then, perhaps, TORREYA would be able to give regularly a scholarly paper on some general phase of botany, a shorter technical paper, at least one somewhat popular illustrated article, reviews of current botanical books and papers, some discussion of apparatus, materials, and methods of interest to teachers of botany, and news items of contemporary botanists and botanical movements. To accomplish this a full editor's drawer is necessary. Were it *once* well-filled, more subscribers or more of those "who pay" would be assured — with sufficient money for more numerous illustrations, which in turn would encourage authors TORREYA-ward.

JEAN BROADHURST.

TEACHERS COLLEGE.

OF INTEREST TO TEACHERS

The experimental work now included in the plant physiology of the high school varies greatly in the number and kind of experiments. More important, pedagogically, is the variation in method for "plant experiments" may mean any of the following: the passive observation of work done wholly by the teacher, or the completion — almost as passively — of certain, definite, and detailed exercises to reach certain and definite results, or the working out of questions in which the accompanying suggestions, the lack of definite, predicted results, or the practical applications required demand independent reasoning and, perhaps, allow some slight opportunity for originality in method or device.

The questions "Should the physiological work in high school botany be more or less quantitative? If qualitative only, how can correct ideas as to time, amount, etc., be assured?" which appeared in the March TORREYA have had several answers of interest. Those given this month are chiefly brief statements of the writers' opinions on the first part of the above question and in two cases lists of experiments are included. Later, TORREYA will print as part of this same discussion longer papers by Mr. Joseph Y. Bergen, author of various well-known text-books on botany and by Professor Julius Sachs, of the department of secondary education in Teachers College, New York City.

Fred L. Charles, DeKalb, Illinois. — Chiefly qualitative, but not wholly so. Experiments by the pulpils individually or in groups of two; also demonstrations by the pupils.

We are now using Osterhout's "Experiments with Plants."

Fr. Holtz, Brooklyn, New York. — I do not think first year students in the high school are able to do or appreciate quantitative work very much. I do not believe that much quantitative work is done anywhere with such students. I believe thoroughly in physiological experiments, however. A little notion of quantitative work may be given by making *comparative* or *relative* studies which are not exact in quantities.

Willard N. Clute, Joliet, Illinois. — Physiological botany, to best serve the most people, should be entirely qualitative. The trouble with all of us is that we are too much in awe of the college

and what it requires for entrance. The fact that so few take up botany in college is reason enough for our making the high school course such as described above.*

George W. Hunter, New York City. — Quantitative physiological work for the student of thirteen with the appliances he will find in the average New York home is out of the question. I prefer to set my problems for the student in such a way that he will work out the simplest kind of generalities himself. Then in the laboratory experiments may be set up and worked out as demonstrations. This shows to the student the value and place of *quantitative* work in the experiment — and often his own shortcomings.

Emmeline Moore, Trenton, New Jersey. — Physiological work in botany involves experimentaton of a quantitative as well as of a qualitative nature. It is true that the so-called qualitative experiments are more numerous than the quantitative ones in the lists of experiments which are usually performed but a plant is a living organism, and since it is a living organism "time" and "amount," in a general way, constantly enter as factors in the conditions which affect its life. A classification of experiments into quantitative or qualitative as such would tend to make the work, for the high school grade of pupils, artificial and mechanical and very probably obscure the principle involved in the experiment.

Elsie M. Kupfer, New York City. — I divide the physiological work in botany into two groups one of which includes experiments performed by pupils individually at home or in school, and the other those demonstrated by me in class. As my room is in use for work either by myself or some one else every period of the day, group work becomes impossible. I usually ask to have the experiment actually brought in, so as to avoid shirking.

The following list of the experiments performed by each pupil is not given in any related order:

1. On the force exerted by swelling seeds.
2. On the relation of water to germination.
3. On the relation of heat to germination.

* Editor's note. — See the discussion in the June TORREYA.

4. Food tests (starch, proteid, fats, and sugar) in all seeds studied (in class).

5. On response of roots to gravity.

6. On response of stems to gravity.

7. On conducting region of root.

8. On conducting region of stem.

9. Osmosis experiment to show the importance of water for rigidity of root (performed on carrot).

10. On positive phototropism of stem.

11. To prove that CO_2 is evolved by growing seeds (with lime water).

12. To prove that seeds use up oxygen in germinating.

13. To show transpiration.

14, 15. To show the functions of the veins of the leaf.

16. Etiolation experiment.

It seems to me that the qualitative side is all that we can profitably insist on in our high school course. I do not lay very much stress on the quantitative side, and doubt whether the conceptions of time and amount as applied to botany have very great value for pupils of this age.

L. S. Hawkins, Cortland, New York.— It seems to be advisable to take up the plant as a biological unit and in so doing to consider the general conditions governing the germination of seeds and the growth of seedlings. In this way we try to make the work, as far as possible with the apparatus at hand, quantitative. This work is followed by a series of experiments with the growth and function of the vegetative organs. I have tried two methods of having the experiments done. (1) Each student did each experiment. (2) One student from a group did one or more experiments and reported the results to the members of the group. In each case the results of the experiment were exhibited in the laboratory as material for demonstration of the explanation of the experiment. I find that the individual method is by far the more satisfactory. The number of pupils being so great in comparison to the room we have, we are obliged to have the experiments done at home and the results brought to class. I will enclose the list of experiments which represents the work done along the

line of physiological work. Of course you understand that in this State there is a definite course for every school to follow.

1. To test seeds for starch.
2. To test seeds for proteid.
3. To test seeds for sugar.
4. To test seeds for fat.
5. To test seeds for mineral matter.
6. To determine the temperature best suited to seed germination and the growth of seedlings.
7. To determine the relation of moisture to seed germination and the growth of seedlings.
8. To determine the relation of air to germination.
9. To determine what gas is given off by germinating seeds.
10. To determine the relation of light to seed germination and to the growth of seedlings.
11. To determine the effect of soil upon seed germination and the growth of seedlings.
12. To determine the use of the cotyledons to the seedling.
13. To determine the use of the endosperm to the corn seedling.
14. To determine the cause of the arch of the hypocotyl.
15. To determine where the increase in length in the root is most rapid.
16. An experiment to show osmosis.
17. To determine where the root hairs are most numerous.
18. To determine the direction of growth of roots when uninfluenced by gravity.
19. The use of the corky layer to the stem.
20. The path of sap in the stem.
21. To show transpiration.
22. To show photosynthesis.
23. To show respiration of aquatics.

Under the title "Organizing a field trip," H. M. Benedict has an article in the April number of the Nature Study Review which is particularly *à propos* at this season of the year. His discussion of the subject is from the standpoint of a course in general biology

but the matter contained is equally applicable to a course in botany. In his opinion, "The reason why the field excursion is so often unsatisfactory is that insufficient preparation is made for it. The plain fact of the matter is that a field trip requires more careful preparation on the part of the students than any recitation or laboratory period." He explains his methods by describing the preparation made for a specific trip. These include (1) a preliminary reconnaissance by the teacher of the region to be visited, and (2) a detailed outline and questions, similar to those in laboratory manuals, regarding the particular organisms to be observed. The pupils are to be drilled on these beforehand. Then, during the excursion, each is to discover for himself the answers to the questions given. The writer's plea is for excursions sufficiently limited in scope to allow of thorough work, and for careful preparation. He closes with the following: "The only seed from which a love of nature can grow is a fact personally discovered by the child. We may radiate the sunlight of enthusiasm and pour showers of loving appreciation but there can be no growth until the seed is planted."

RALPH CURTISS BENEDICT.

NEWS ITEMS

Dr. F. Noll, professor of botany at Halle, died on June 22 at the age of forty-nine years.

Mr. L. Lause Burlingame has been appointed instructor in botany in Stanford University.

Mr. C. E. Porter has been appointed professor of botany in the University of Santiago de Chile.

Dr. C. H. Shattuck, of Washburn College, has been called to the chair of botany and forestry in the State Agricultural and Mechanical College, at Clemson College, South Carolina.

Professor Edwin M. Wilcox, of the Alabama Polytechnic Institute, has been elected botanist of the Experiment Station and professor of agricultural botany in the University of Nebraska.

Dr. William A. Murrill, assistant director of the New York Botanical Garden, gave a two weeks' course of lectures in July

at the Biltmore Forest School on the fungi injurious to forest trees.

Dr. Raymond H. Pond, who returned to New York in May after courses of study in Jost's laboratories in Bonn and Strassburg, has been appointed biologist of the Metropolitan Sewerage Commission of New York.

Mr. C. F. Baker has resigned the position of curator of the herbarium and botanical garden of the Museu Goeldi at Para, Brazil, and has returned to Claremont, California, as associate professor of biology in Pomona College.

The Jamestown exhibition collection of models of fruits and vegetables, probably the most complete series of its kind that has ever been prepared, has been given to the United States National Museum by Mr. J. N. Léger, the Minister from Haiti. There are over one hundred models, including the following: cashew, ginger plant, mango, alligator pear, custard apple, pomegranate, guava, tamarind, naseberry, and bread fruit.

Massachusetts, justly termed a leader in economic reforms, has already appointed a State Conservation Committee to coöperate with the national committee recently appointed by President Roosevelt. The chairman is Mr. F. W. Rane, the state forester, under whose management much has recently been done to obtain and preserve forest lands, through the recent wise and generous provisions of the State Legislature.

The San Jacinto forest in California, one of the original thirteen national forests reserved by President Cleveland in 1897, has been renamed by President Roosevelt in honor of the President under whose administration the first national forests were created. Nearly 25,000,000 acres were at that time made into national forests upon the recommendation of the National Academy of Sciences, and in honor of Washington's one hundred and sixty-fifth birthday anniversary.

the TORREYA

September, 1908

Vol. 8. No. 9.

BOLETI FROM WESTERN NORTH CAROLINA

By William A. Murrill

It was my privilege to spend two weeks during the past summer with Dr. C. A. Schenck, Forester of the Biltmore Estate, in Pisgah Forest, Transylvania Co., North Carolina, about fifty miles southwest of Asheville. Dr. Schenck's summer home is in Pink Bed Valley, 3,200 ft. above sea level, with surrounding ridges reaching a maximum elevation of 4,500 ft. The forest there is mostly composed of hardwood species, chestnut, oak, and tulip predominating, while pitch pine is found sparingly on the dry ridges and hemlock and white pine along the streams. Maple, birch, hickory, basswood, sourwood, black gum, black locust, butternut, ash, and Fraser's magnolia also occur as minor hardwood species. *Rhododendron*, *Kalmia*, and *Azalea* are exceedingly abundant, in many places forming impenetrable thickets which, when in flower, are visible from a distance as pink-colored masses or "beds."

About the middle of July, when I arrived at Pink Bed Valley, frequent showers had developed quantities of fleshy fungi, among them many boleti, which were collected and critically studied in the fresh condition, and afterwards dried by artificial heat. Dr. H. D. House very kindly assisted me in collecting, and the fact that several interesting species are represented by more than one or two specimens in this collection is largely due to his perseverance.

The following list includes practically all the species of Boletaceae collected during my stay in Pink Bed Valley arranged in alphabetical order under the generic and specific names commonly recognized in this country.

[No. 8, Vol. 8, of Torreya, comprising pages 181–208, was issued September 1, 1908.]

Boletinus pictus Peck.

Collected twice in considerable quantity, once in swampy ground and once on a dead locust log in low woods.

This species has the large radiating tubes of the genus *Boletinus*, and is easily distinguished among the Boletaceae by the conspicuous red scales that adorn its pileus and stem. It is fairly common in the woods and mossy swamps of the mountainous regions of the eastern United States. Edible.

Boletus americanus Peck.

Common, especially near pines.

This is a common and widely distributed edible species having a yellow, viscid cap usually dotted or streaked with red and a slender yellow stem covered with reddish-brown viscid dots which become black on drying.

Boletus auriflammeus B. & C.

Five specimens were collected on a well-drained bank exposed to the sun about two hours just after midday. Dr. House afterwards sent me a number of fine specimens.

This species is of great interest, being very rare and very beautiful. It was originally collected in North Carolina by Rev. M. A. Curtis and sent by him to Berkeley, who described it. Peck found one plant at Sandlake, New York, and it was also reported by Beardslee from Brookside, West Virginia. The description given by Berkeley is both incomplete and inaccurate, but the bright golden-yellow color of the pileus and stem should easily distinguish it. The mouths of a few of the tubes sometimes appear scarlet, especially on drying, but this character is not at all conspicuous. The stem is beautifully reticulated.

Boletus auriporus Peck.

Occasional on banks and in open woods.

This species may be easily recognized by its bright golden-yellow tubes which retain their color on drying. The cap is usually reddish-brown and the stem is viscid if the weather is not too dry. Edible.

Boletus bicolor Peck.

Several times collected on banks and in thin woods.

A beautiful species, with smooth purplish-red cap, bright yellow tubes, and smooth, red, or yellow stem. When broken both flesh and tubes change to blue. This plant has been reported from only a few localities. Beardslee reported it very common in the mountains of West Virginia. Edible.

Boletus castaneus Bull.

Rare in sandy soil in open woods.

This species has a hollow stem and dries easily. The cap is reddish-brown, the flesh white and unchangeable, and the free tubes are at first white then yellowish. It is widely distributed and usually common. Edible.

Boletus chromapes Frost.

Very abundant in open woods throughout the valley and on the adjoining slopes.

A very attractive species, and one easily recognized by its stem, which is bright yellow near the base and finely scabrous over its entire surface. The cap is pale-red and the tubes and most of the stem white. Edible.

Boletus chrysenteron Fries.

Found a few times on roadside banks.

This species is widely distributed and usually common. The cap and stem are usually red and the tubes yellow and large. It dries easily, being spongy-tomentose in texture. The surface of the cap is soft, finely floccose, and often cracked. Edible.

Boletus cyanescens Bull.

Rather common in open woods, at times solitary, but usually gregarious.

A common and widely distributed plant easily known by the deep-blue color which its flesh and tubes assume when wounded. The cap is pale-tan and floccose-tomentose, the tubes and hollow stem white or pallid. It dries very readily.

Boletus eximius Peck.

Several times collected in thin woods and along roadsides.

The stem of this species is very characteristic, being lilac-gray and furfuraceous, while the cap and tubes are chocolate-brown. This species has been rarely reported, but I have it from New

England, New York, and Virginia, as well as from North Carolina.

BOLETUS FELLEUS Bull.

Collected only once or twice, but probably common later.

This abundant and widely distributed plant is easily known by the bitter taste of its flesh. The tubes are flesh-colored and the cap usually some shade of brown. When fully grown, it is sometimes over a foot in diameter. Said to be poisonous.

BOLETUS FUMOSIPES Peck.

Rather common on shaded roadside banks.

This species has been almost unknown except to Professor Peck, who described it in 1898 from material collected at Port Jefferson, Long Island. Professor Atkinson found it in abundance in North Carolina, and I collected it also in Virginia. It is peculiar in having a pale bluish-green band at the top of the stipe. The cap is also very reticulate-rimose, and the tubes an unusual grayish-white, afterwards discolored by the deep ochraceous-brown spores. When once seen, it is difficult to confuse it with any other species.

BOLETUS GRACILIS Peck.

Collected three or four times, but only one plant was found on each occasion.

This species is not generally well known, although said to be abundant in some localities. It belongs to a small group having flesh-colored spores, which tinge the white tubes at maturity. *B. felleus*, *B. indecisus*, and *B. nigrellus* are large plants with thick stems, from which *B. gracilis* is easily distinguished by its slender habit and small size.

BOLETUS GRANULATUS L.

Common, preferring open places in woods, and found more abundantly near pines.

This species is quite common in the eastern United States, usually appearing in scattered groups near pine trees. The cap is very slimy and brownish when moist, changing to yellow on partial drying; the tubes and stem are yellowish, with viscid dots which become black on drying. It is rather easy to confuse this species with *B. americanus*. Edible.

Boletus griseus Frost.

Quite common in open places in woods.

This species is very similar to *B. retipes*, but is easily distinguished in the field by its pure white tubes, those of *B. retipes* being decidedly yellow. The cap is gray and the stem usually whitish. Edible.

Boletus indecisus Peck.

One of the most common species, occurring in clusters and colonies especially in clayey soil along the edges of exposed roads and trails.

This species is closely related to *B. felleus*, from which it is distinguished by its mild taste, that of *B. felleus* being decidedly bitter.

Boletus luridus Fries.

Collected in abundance, especially on clay banks along roads.

This species, said to be very poisonous, may be at once distinguished from the other species mentioned here by the reddish-orange mouths of its tubes, the interior of the tubes being yellow. When cut, the entire cut surface of cap, tubes, and stem changes at once to blue. All boleti with red or reddish tube-mouths should be avoided when collecting mushrooms for food.

Boletus luteus L.

Collected three times in open sandy soil in woods.

Cap very viscid, yellowish-brown; tubes and stem yellow, the latter dotted and also provided with a large white annulus. This is a well-known and widely distributed edible species commonly found in coniferous woods.

Boletus miniato-olivaceus Frost.

Rather common in open woods near roads and trails.

Cap vermilion, tubes bright yellow, stem yellow with pink markings. This species is easily distinguished among the red boleti by its quick change to blue at any point, either outside or inside, where bruised or even touched with the fingers. It is reported from New England south to West Virginia, and is said to be poisonous.

Boletus Morgani Peck.

A single fine specimen was collected by Dr. Schenck on one of the mountain trails. After my departure Dr. House found several specimens, which he sent to the Garden Herbarium. Dr. Harper also collected it recently in Georgia.

This is a rare species, described from Kentucky and found in Virginia and one or two other states. Cap viscid, smooth, perfectly glabrous, shining testaceous; tubes flavous, becoming greenish from the spores; stem very long and rough with deep reticulations, flavous above, purplish-stained below. The long rough stem should distinguish it from all other boleti except *B. Russellii*, which differs in having a dry, tomentose cap.

Boletus Peckii Frost.

One of the most common species, usually along the roads in rather open woods.

Easily recognized by its red cap with a bloom like that of a peach. The tubes and upper part of the stem are yellow, the remainder of the stem red, and the whole surface reticulated. The stem of *B. speciosus* is entirely yellow and that of *B. bicolor* is not reticulated. Reported edible.

Boletus Ravenelii B. & C.

About ten plants were collected in all, some of them very fine. Dr. House later found many more. This was one of the few species that preferred the deep shade of the mountain laurel.

Cap dull reddish, both it and the stem covered with a light yellow powder, by which the plant is readily distinguished. The conspicuous veil was found more than once covered with a print of the olive-green spores. As the stem elongates, part of the veil remains attached to the margin of the cap and part forms a clinging cortina on the stem. I tasted the flesh and found it sweet. This beautiful species has been several times reported in the eastern United States, but it is not abundant.

Boletus retipes B. & C.

A common species in thin woods.

This species was first described from plants collected by Curtis in North Carolina. It has since been found quite commonly in

the eastern United States, and as far west as Wisconsin. The cap varies from yellow to brown, the flesh and tubes are yellow, and the yellow stem is beautifully reticulated to the base.

Boletus scaber Fries.

Common in various habitats.

This is one of the best known and most abundant of all the species of boleti. The scabrous stem and the unchanging white flesh and tubes should distinguish it, in spite of the variable colors of the cap. Edible.

Boletus speciosus Frost.

Not rare in openings in woods.

This beautiful species is easily known by its apple-red cap without a bloom and its brilliant yellow tubes and stem, the latter reticulated. *B. bicolor* and *B. Peckii* are related species.

Boletus separans Peck.

A very abundant and very handsome species, found usually in open woods near the roads and trails. Also found in abundance at Falls Church, Virginia, during the latter part of July.

Cap and stem brownish lilac, the latter reticulated; flesh and tubes white; spores yellowish-brown.

Boletus subtomentosus L.

Quite common along roads and trails.

This widespread plant has been reported from many parts of America. It is one of the boleti that may be dried in the sun, being of a spongy rather than a fleshy texture. The cap is usually yellowish-brown or olive-tinted, with a distinct tomentum, and the large tubes and stem are yellow. *B. chrysenteron*, a closely related species, usually has more red both in cap and stem. Edible.

Boletus Vanderbiltianus sp. nov.

Pileus subconical, 2–3 cm. broad, 1–2 cm. thick; surface smooth, dry, conspicuously ornamented on the umbo with dense, pointed, imbricated, dark purple scales, which become gradually smaller and give place to minute purplish specks near the margin, the color changing from atropurpureous to latericeous; margin thin, undulate, concolorous, with a distinct inflexed sterile portion 1 mm. broad: context thick, fleshy, firm, cream-colored, unchange-

able, sweet to the taste; tubes adnate, slightly decurrent on one side, salmon-colored near the margin, incarnate next to the stipe, unchangeable within, the mouths becoming incarnate as the spores mature, mouths angular, 1 mm. or less broad, elongated to 2 mm. near the stipe, edges thin, entire: spores oblong-ellipsoid, smooth, pale ochraceous-brown, $9–12 \times 2–3\,\mu$: stipe curved, cylindrical, slightly enlarged above, delicately pruinose, not reticulated, deep salmon-colored, changing to incarnate, finely purplish-dotted like the margin of the cap, solid and cream-colored within, $2–3 \times 0.5$ cm.

A solitary specimen of this very beautiful little species was first found by the writer on the roadside in thin oak woods. Dr. House later collected several specimens of it and sent them to me. He reports it a slower grower, requiring three to five days to develop from the button stage, and its maximum height is rarely more than four centimeters.

FISTULINA HEPATICA Fr.

Common on chestnut stumps.

This well-known and widely distributed edible species is easily recognized by its resemblance to a piece of beefsteak. It is found almost exclusively, in this country, on chestnut and oak stumps.

FISTULINA PALLIDA Berk. & Rav.

Found only once on the base of a small decayed chestnut tree by the roadside.

This species probably occurs throughout most of the eastern United States, but it has been rarely collected. The cap is paler in color than that of *F. hepatica* and the stem is longer and more branched. These characters, with the white flesh, should easily distinguish it.

STROBILOMYCES STROBILACEUS (Scop.) Berk.

Abundant on shaded banks along roads and trails.

This species is blackish and shaggy, with white flesh, which on being cut or broken changes to reddish and finally to black. It is abundant everywhere in the woods, and is often collected for food.

KEY TO THE ABOVE SPECIES *

* See key to groups in TORREYA for March, 1908.

A. Cap red, without and within, stem very short. *Fistulina hepatica*

Cap fawn-colored without, white within, stem much longer and branched. *Fistulina pallida*

B. Tubes large, arranged in radiating rows; pileus and stem adorned with conspicuous red scales. *Boletinus pictus*

C. Pileus blackish and shaggy; flesh white, changing to reddish when bruised. *Strobilomyces strobilaceus*

E. Stem annulate and glandular dotted. *Boletus luteus*

F. Pileus yellow, often streaked with bright red; stem slender, 8 mm. or less in diameter. *Boletus americanus*

Pileus brown when moist, yellowish on drying; stem stouter, over 8 mm. in diameter. *Boletus granulatus*

G. Stem shaggy and lacerate, with deep reticulated furrows; cap viscid and glabrous. *Boletus Morgani*

H. Flesh and tubes becoming deep blue when wounded. *Boletus cyanescens*

Flesh and tubes white or yellowish, unchanging when wounded. *Boletus castaneus*

I. Stem and pileus covered with a conspicuous yellow powder. *Boletus Ravenelii*

J. Pileus large, stem 1 cm. or more thick.

Flesh decidedly bitter. *Boletus felleus*

Flesh not bitter. *Boletus indecisus*

Pileus small, stem about 5 mm. thick. *Boletus gracilis*

K. Tubes yellow within, mouths reddish-orange. *Boletus luridus*

L. Stem entirely white or grayish-white. *Boletus scaber*

Stem conspicuously bright yellow near the base. *Boletus chromapes*

M. Pileus gray, tubes white. *Boletus griseus*

Pileus yellow or brown, tubes yellow. *Boletus retipes*

Pileus red.

Stem bright lemon-yellow throughout. *Boletus speciosus*

Stem red below, yellow above. *Boletus Peckii*

N. Tubes white, afterwards colored by the ochraceous brown spores. *Boletus fumosipes*

Tubes salmon colored, spores yellowish-brown. *Boletus Vanderbiltianus*

Tubes yellow or greenish-yellow.

Tubes changing to blue when wounded.

Pileus subtomentose. *Boletus chrysenteron*

Pileus glabrous.

Pileus bright red to olivaceous, the entire plant quickly turning blue at any point where touched. *Boletus miniato-olivaceus*

Pileus dark red, not sensitive, changing color slowly or not at all when bruised. *Boletus bicolor*

Tubes not changing to blue when wounded.

Pileus subtomentose, tubes becoming greenish-yellow. *Boletus subtomentosus*

Pileus glabrous, tubes remaining a beautiful golden-yellow even after long drying. *Boletus auriporus*

O. Stem and pileus bright golden-yellow; plant small. *Boletus auriflammeus*

Stem brownish-lilac or chocolate-brown.

Stem reticulated. *Boletus separans*

Stem furfuraceous, not reticulated. *Boletus eximius*

ew York Botanical Garden.

A NEW CRETACEOUS BAUHINIA*

By Edward W. Berry

The genus *Bauhinia* Linné of the Caesalpiniaceae has upwards of one hundred and fifty species in the modern flora with representatives in the tropics of America, Asia, Africa, and Australia. A fossil species based on leaf remains from the Tortonian or Upper Miocene deposits of OEningen, Baden, was described by Heer as long ago as 1859.† Soon afterward Unger in his *Sylloge plantarum fossilium* described two additional species,‡ both based on pods, from Croatia. The discovery of a handsome species in the much older Cretaceous deposits of New Jersey was made the occasion of an interesting communication to the Torrey Botanical Club by Professor Newberry in 1886 § and this and another larger species were subsequently fully described and illustrated in his monograph of the Amboy clay flora.|| Meanwhile Unger had described a species from the Aquitanian of Kumi on the island of Euboea off the eastern coast of Greece¶ and Velenovsky had described a leaf from the Cenomanian of Bohemia under the name of *Phyllites bipartitus*** which he considered as a probably abnormal leaf of *Hedera primordialis* Saporta but which as Newberry suggested is almost certainly another species of *Bauhinia* (*l. c.* 1896), and more closely related to the existing oriental species than to those of America.

Quite recently the writer discovered Newberry's *Bauhinia cretacea* in collections from the Tuscaloosa formation of Alabama, and from higher levels in the same formation a large and ornate leaf of a new species belonging to this genus.

The occasion for this brief note, however, is the discovery of

* Published by permission of the Maryland Geological Survey.

† Heer, Fl. Tert. Helv. 3: 109. *pl. 134. f. 21.* 1859.

‡ Unger, Sylloge 2: 31. *pl. 11. f. 2, 3.* 1862.

§ Newberry, Bull. Torrey Club 13: 77, 78. *pl. 56.* 1886.

|| Newberry, Mon. U. S. Geol. Surv. 26: 91, 93. *pl. 20. f. 1; pl. 43. f. 1–4; pl. 44. f. 1–3.* 1896.

¶ Unger, Foss. Fl. v. Kumi, 61. *pl. 15. f. 36.* 1867.

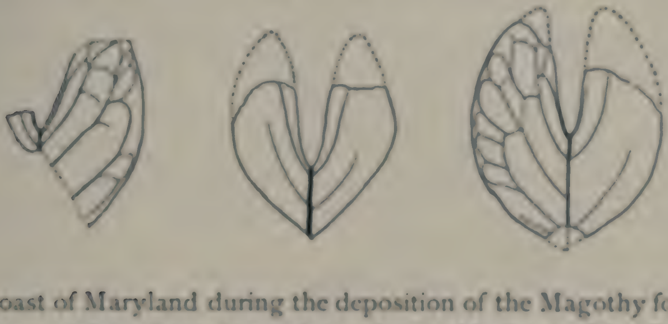
** Velenovsky, Fl. bohm. Kreidef. 4: 12. *pl. 6. f. 4.* 1885.

a very distinct smaller-leaved species in the Magothy formation at Grove Point, Maryland. This may be characterized as follows:

Bauhinia marylandica sp. nov.

Leaves small, about 3 cm. in greatest length by 2.5 cm. in greatest breadth, elliptical in general outline, bilobate; the apical sinus narrow and pointed, reaching one-half to two-thirds of the distance to the base; lobes narrow, ascending, somewhat falcate in outline, obtusely pointed; midrib straight, giving off one, two, or three sharply ascending pairs of opposite, camptodrome secondaries, which give off a series of broadly rounded inequilateral tertiary arches which are directed upward and outward; the upper pair of secondaries the most prominent; from the juncture of the midrib and sinus a pair of much reduced secondaries is given off and these join the secondary next below in one or two broad arches.

The form and venation of these leaves is exactly like several of the existing forms and is so well marked that there can be no doubt of the existence of a species of *Bauhinia* growing along



the coast of Maryland during the deposition of the Magothy formation, a species whose descendants along with those of its Cretaceous congeners migrated finally to their present tropical habitat, perhaps gradually with the oscillation of climatic conditions, and perhaps not until the Pleistocene glaciation to the northward forced them to make a comparatively sudden retreat to the southward.

Johns Hopkins University,
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SHORTER NOTES

A TERATOLOGICAL NOTE ON TIMOTHY.— The usual farm crops afford many instances of double (and sometimes triple) fruits. Such specimens of red clover and field corn are rather common. I have never noticed such abnormalities in timothy, however, until this year, when a partially double head of timothy was found in our lane. The whole head is 7.6 cm. long, being single for 4 cm. of its length and having the upper part divided into two stalks of 3.6 cm. each. The upper divisions are almost equal in diameter to the basal part, and are fully fruited, except occasionally on the inner sides. The divisions diverge at an angle of 35 degrees. H. R. ROMINE.

ABNORMALTIES IN THE RADISH, CLOVER, AND ASH.— Several seedlings of the radish grown by our students this year in their seed germination studies had one cotyledon some distance below the other; in one instance the cotyledons were 3 cm. apart. A specimen of white clover, *Trifolium hybridum*, was found along the roadside this June with seven large flowerets 2.3 cm. below the head itself. The flowerets of the head were perhaps not so numerous as usual. From an American ash tree near our school buildings I picked several leaves which to me seemed very unusual. There were two sets of leaflets instead of one set at the nodes along the rachis; some had three pairs of such doubles instead of three pairs of leaflets. EMMELINE MOORE.

NEW JERSEY STATE NORMAL SCHOOL.

REVIEWS

Knuth's Handbook of Flower Pollination*

The first volume of this series containing 381 pages and 81 figures appeared last year. It considers the modes of pollination and the types of flowers and their insect visitors, special attention being given to their structure and mutual adaptability.

* Knuth, Paul. Translated by J. R. Ainsworth. Volume II, Handbook of Flower Pollination, Large 8vo, viii + 703. f. 1–210. 1908. Oxford, Clarendon Press. Cloth 31s. 6d. Half morocco, 35s. net.

The second volume with a portrait of Hermann Müller, upon whose studies the series is based, has now appeared. This volume is special in nature and contains "an account of all known observations upon the pollination of the flowers of plants of Arctic and Temperate zones." From the contents, however, we infer that it is devoted to certain groups of dicotyledones ranging from the Ranunculaceae to the Stylidieae. The sequence of the groups is somewhat different from the arrangement with which we are familiar and to give an idea of their arrangement and of the scope of the work mention may be made of the more important orders and families, employing the classification in common use in this country: Ranales, Papaverales, Violaceae, Polygalaceae, Caryophyllaceae, Portulacaceae, Hypericaceae, Malvales, Geraniales, Sapindales and Rhamnales, Rosales, Myrtales, Passifloraceae, Cucurbitaceae, Cactaceae, Umbellales, Rubiales, Valerianales, and Compositae which includes our Carduaceae and Cichoriaceae.

The remaining families and orders will be discussed in the third volume, while the fourth and final volume has been advertised to deal similarly with plants outside Europe. The orders mentioned above are not recognized in the discussion, the species being arranged in fifty-six orders that correspond to our families. For example the Ranales are discussed under six orders and the Sapindales and Rhamnales are represented by six orders promiscuously intermingled. The families (orders) of an alliance are also very generally taken up in the reverse order of their complexity. The rose group begins with the Leguminosae and follows with the Rosaceae, Saxifrageae, and Crassulaceae, though the Myrtales may possibly be cited as a reversal of this treatment in which the reduced Halorrhagidaceae (Halorageae in the text) are followed by the Melastomaceae, Lythrariae, and Onagrariae. Just what purpose the authors had in mind by this reversion of sequence — of going up the biological scale backward so to speak — is not clear. We take it that an attempt has been made to represent in this arrangement of the families, their natural relationship. In some cases the sequence is a very probable one, as from the Umbellales to the Rubiales, Valerianales, and Compositae; but in other cases the arrangement is unusual to

say the least, as for example the association of the Violaceae, Polygalaceae, and Caryophyllaceae, in the order given, these groups following the Resedaceae and leading to the Hypericaceae. No attempt has been made to comply with the terminology now commonly employed and we find the so called orders ending in a great array of final syllables, partially illustrated above in the references to the rose and myrtle alliances.

The illustrations are deficient in number and lacking in quality. A criticism of this nature need rarely be passed on the superb book work of the Clarendon Press ; indeed, it seems a pity to mar so excellent a book as this with inferior drawings which at times might almost be termed grotesque. Little care has been bestowed upon the size of the figures. A diagram of *Lythrum*, dealing with only gross morphological characters, is given a half page, while many illustrations of Cruciferae, Rosaceae, etc. are so reduced as to obscure the relationship of the organs. The figures are often overshaded with the result that they lack clearness or are even smudgy.

The only means of referring to the numerous species in the text is to be found in the index of the fifty-six orders that follows the title page. We understand that a full index will be included in the final volume but the publishers should have recalled that this volume will be extensively used by students as a reference book and that the lack of an index is a serious disadvantage. A similar deficiency is the lack of a glossary, especially since terms are employed that are not universally current.

The above criticisms, however, are of minor consideration and are not intended to reflect upon the excellence and worth of the discussion. The treatment accorded the orders, genera, and species will be universally appreciated by those interested in this phase of botany. The citation of the literature, and the discussions of the morphological and biological features of the flower, make the book indispensable as a work of reference. Much adverse comment has been passed upon ecological studies of this nature that have been so well developed upon the continent. We feel, however, that they are of great importance and know of no better way of introducing the study of flowering plants to

the student and of arousing his interest in it. Furthermore, it is worth one's time to learn the real significance of the morphology of the flower and to understand that it has a purpose other than to furnish means for the identification of the plant.

CARLTON C. CURTIS.

COLUMBIA UNIVERSITY.

OF INTEREST TO TEACHERS

QUANTITATIVE WORK IN HIGH SCHOOL SCIENCE COURSES

BY JULIUS SACHS

From the general standpoint of the object of secondary education, and not from the point of view of a science expert, I offer you a few comments on the influence of quantitative work in our high school science courses. It is claimed that no science is worth teaching, especially no physics, that does not make for quantitative accuracy; the college officers, however, who imbue the future teachers with this view, know very little of the hesitancy and helplessness of our high-school students; they do not know, as teachers of long experience know, that the steps of the students must be carefully directed in their experimentation, and that there is much more than unaided performance in the observations they record. It is safe to say that even if the students grasp the topics handled in this mathematico-physical work, they certainly fail of seeing the larger relations of the individual experiment to the world of physical phenomena. I am inclined to reverse the usual estimate that teachers place on the relative importance of their work in the high school; to me the most valuable and most important part of the work is that effected with pupils who cannot or will not advance to the college stage; for them surely, and I should like to add for *all* high-school students, it is important that they should be led to comprehend the physical, chemical, and biological elements that enter into the various industrial, agricultural, and mechanical problems. If then you wish to add a special fundamental training along the line of quantitative work, let that constitute an advanced course

for the few. The fact that in subjects appealing especially to boys and girls the initial interest wanes and that there is a diminishing choice of scientific subjects by our students proves not that pupils shirk serious work, but that much of our present science teaching is misdirected. Whatever the degree of specialization that may be desirable in a college instructor of science, the high school requires teachers of breadth of view; you cannot satisfy the pupil's desire for a broad outlook into the interrelations of phenomena, unless you yourself possess it. Too many of our teachers believe themselves discredited in the eyes of their associates, if they profess interest in three or four related fields of scientific inquiry; we cannot too soon revert to the type of scientific teacher that the Huxley school stood for — the man who sees the application of natural laws in several fields of organic and inorganic science. This need not involve superficiality; a teacher may still be preëminently interested in one line of inquiry, and yet recognize the duty of arousing his pupils to the relationship that pervades the world of phenomena.

TEACHERS COLLEGE.

QUANTITATIVE WORK IN HIGH SCHOOL BOTANY

BY JOSEPH Y. BERGEN

In reply to your request for an opinion in regard to quantitative work in high school botany I am glad to say a few words.

The question is really a general one — the high school teacher of almost every science subject, from chemistry to botany, has had to ask himself whether any quantitative work should be done, and if it is undertaken what proportion of the total laboratory time it should occupy and what degree of accuracy is to be required.

To me it seems that both extremes are wrong. Some of the worst-fitted candidates for the Harvard University entrance examination in physics used to come from schools on the one hand in which hardly any measurements of objects which could enter the jaws of a micrometer caliper were made without its agency, or from schools on the other hand in which the teacher's

demonstrations of physical principles were only less entertaining than the monthly public declamations or the recitals of the banjo club.

It would seem to be folly to bar out from the laboratory work in botany such studies as those on the blanching effect of cutting off light from green portions of the plant body, because it is not easy to express the effect in convenient units. So, too, it is well worth while to have every student produce positive and negative heliotropic movements in convenient portions of the plant body, and yet it would be an unprofitable labor to determine exactly what per cent. of the total sunlight is required to initiate such movements. But even the beginner in botany (of high school age) cannot get out of his subject nearly all that it can give him unless he has made some careful quantitative studies, not all of them necessarily physiological. For example, a few of the topics which readily lend themselves to quantitative treatment are: the relation of temperature to germination, to asexual reproduction (as in bacteria and yeasts), the percentage of water in the plant body, the effect of lowered temperature on root absorption, the approximate pressure of the root tip, the effectiveness of corky epidermis in preventing evaporation, the relative transpiration rates at various temperatures, critical temperatures and illuminations to produce nastic movements of foliage leaves and floral leaves, the minimum illumination for typical shade plants, and the number of competitors on a unit area of weedy soil. If the teacher has not had considerable practice in making quantitative studies of the character of those here mentioned, he may find it highly profitable to complete a goodly number of them and then endeavor to make a statement of the comparative accuracy and vitality of his knowledge of each topic before and after subjecting it to quantitative investigation.

If botany is to stand as an important subject in high school courses it must claim a place there not only because it fosters a love of nature and cultivates the esthetic sense — and these it should do — but also because it affords training in careful observing and scientific thinking. Will the botany teacher who objects to quantitative laboratory work be good enough to

suggest to those of us who do believe in it any substitute for such work which can be guaranteed to go as far in developing rigorous habits of thought?

CAMBRIDGE, MASSACHUSETTS.

Starch grains are made the subject of a recent paper by Professor Henry Kraemer, of Philadelphia. Among the statements of interest to high school pupils are the following: The starch grain consists of two nearly related substances, the one a colloid, which takes up aniline stains, and the other a crystalloid, which becomes blue with iodine. The starch grain is made up of concentric layers, one series of which contains a large proportion of crystalloids, while the other alternate layers are composed mostly of colloids. While heating the starch grains in water rapidly changes the structure of the grain, it is only upon the addition of chemicals or ferments that denaturization is brought about.

Dr. John W. Harshberger has recently found a slime mould which had left its saprophytic habit, assuming a grass-killing one. The slime mould, *Physarum cinereum* Pers., formed over night "patches of blackened grass," and in "a few days these black patches, if disturbed with the foot or a stick, gave off little clouds of dark brown spores. The original patches were small and few in number, from 6 to 12 inches in diameter and of irregular shape. The rains and damp weather of early August, 1905, aggravated the injury to the lawn, for the patches spread over much larger areas and covered portions of lawn 25 feet in diameter, of irregular outline, with smaller patches scattered in the circumscribed space." The disease affected only the leaves, for the above-mentioned patches afterward regained their fresh, green color.

The May *Bulletin* of the Torrey Botanical Club, contains an article by Harry P. Brown on algal periodicity in certain ponds and streams in Indiana which were studied throughout the year. Among the conclusions reached the following are of general interest:

1. An alga growing under steady normal conditions continues, in the region studied, to grow in a healthy vegetative state throughout the year.

2. A sudden change in external conditions checks the vegetative growth of an alga and tends to cause it to enter a resting stage or to form fruit sexually.

3. *Spirogyra varians* is the most widely distributed alga found in this region. It grows under varied conditions. It conjugates at all seasons of the year, depending on hard external conditions, *e. g.*, the drying up of the pond.

The Bureau of Plant Industry has recently given to *Science* authoritative statements regarding the nature of its seed and plant distribution. Among the beneficial activities thus described are the introduction of rapidly growing Arabian alfalfa, which at Mecca, California, last year yielded twelve cuttings instead of eight; the distribution of two new timothies, one of which ripens with red clover, the other being a large yielder; the successful introduction of the date in California and Arizona; the distribution of improved melon, cotton, and tobacco seeds; the introduction of thousands of Japanese rush and sedge plants for the matting industry;* and the department is at present importing hard bamboos from China, drought-resistant forms from India, and giant forms from Porto Rico.

An article on "Plant Pathology in its Relation to Other Sciences," by Dr. Ernest Shaw Reynolds in *Science* for June 19, contains the following: "We must know the normal functions of the plant attacked, and be able to realize in what way they have been deranged. Thus, if a parasite is the cause of the disease, it may bring about the death of the host-plant in one or more of the following ways: It may strangle the plant by clogging the water-conducting vessels, as in the bacterial "wilt" of melons, already referred to. Again, it may give out a poison which kills the pro-

* Editor's Note. — The New York *Tribune* for September 16 announces that in Saskatchewan "hundreds of square miles of reeds available for matting" have been discovered; the credit is apparently due to the United States government.

toplasm of the cells affected, as De Barry describes for one of the *Sclerotinia* diseases. The third method is by absorbing the food, water, or the protoplasm itself, from the cells of the host. This seems, at the present time, to be the most common mode of attack, especially in those diseases, like leafspots, which remain localized in some organ."

Dr. L. B. Walton, of Kenyon College, has made a study of zygospores of *Spirogyra quadrata* (Hass.) Petit to obtain data bearing — in part — upon the causes tending to produce variability. Over 400 zygospores were studied, including those formed by scalariform and by lateral conjugation. "In the first instance (scalariform conjugation) we deal with the results of conjugation between remotely related cells belonging to different filaments. In the second instance (lateral conjugation) we deal with the results of conjugation between sister or adjacent cells of the same filament, a condition closely related to the phenomena of parthenogenesis in other organisms. If the conjugation of germ cells from remotely related individuals tends to variability as Weismann and others would have us believe, conversely the union of closely related cells should afford a decreased variability, the minimum appearing in parthenogenetic forms.

"The results show a condition directly contrary to this, the zygospores of lateral conjugation being approximately 21 per cent. more variable in length and 21 per cent. more variable in diameter than those produced by scalariform conjugation. Consequently direct evidence is afforded in support of the theory of Hatschek (1887) that sex exists for the purpose of limiting and not for the purpose of increasing variability."

Science for May 22, 1908, describes the concerted action of the "owners of timber in different parts of the country in organizing associations to protect their holdings from fire. In the Pacific northwest, the Washington Forest Fire Association has just elected officers at Seattle and begun work for the year with 3,000,000 acres under its care. The plans include a system of patrol by rangers resembling the work done by the United

States Forest Service in guarding against and extinguishing fires. Organizations of similar kind and for a like purpose are at work in Oregon and Idaho. In the latter State, a portion of the expense is borne by taxation and paid from the State Treasury. A western railroad company which holds large tracts of timber has taken steps to guard its property from fire, and during the short time that its plans have been in operation, it has met with most encouraging success. Similar work is being done on the other side of the continent. Forest owners in Maine have gone to work in the same systematic way to control the forests' great enemy, fire. Like organizations are found in other parts of the country, showing how fully it is now realized that protection against fire is of the greatest importance. It is safe to say that fires in this country have destroyed more timber than lumbermen have cut. When timber was abundant, the waste passed almost unnoticed, but now that a scarcity is at hand and an actual wood famine threatens in the near future, the owners of forest lands are waking up and taking action to save what is left." The extensive fires in British Columbia and northern United States this summer emphasize the importance of such measures for the preservation of our forests.

The *Plant World* for May contains an article on "Leather from Cacti: Something New," by Frederick C. Wright. The author says that, "One day, over a year ago, the writer, while handling a piece of bisnaga (*Echinocactus wislizeni*) noticed, after the water it contained was pressed from the fiber," that it became very pliable and strong, like leather, but brittle and chalk-like when dry. Then, "not being a scientist," he began a series of crude experiments to obtain both strength and pliability, which he describes as follows: "I boiled the fiber with mesquite bark and burnt rags to tan and color it. I secured the color, but the fiber did not tan. I soaked it in oil; I used aluminum palmitate, tannic acid, gum arabic, caoutchouc, and I used glue, but none of these gave results. But, late one night soon after, I went to bed and slept the sleep of contentment, with a piece of perfect leather made from cactus fiber in my hand. I used water and glycerine, about

25 per cent. of the latter." On account of the large proportion of water contained in a bisnaga or sahuaro, if the fiber is cut one half inch thick it reduces to about one sixteenth of an inch in thickness. "If a circumferential cut is made (as one would peel an apple) from 20 to 40 feet in length of fiber may be obtained from cacti of the larger growths." "Immediately after cutting the fiber is placed direct in the tanning bath. The tanning process requires from two to three hours, according to the thickness of the fiber," but the drying process is more tedious. As much water as possible is first pressed from the sheet, after which it is hung up to dry, or dried by artificial heat. When dry the leather is white or tan, and may be stained any color desired. "The entire trunk of this giant, which reaches a height of 40 to 75 feet and a maximum diameter of two feet, may be utilized in the manner described, and, as the sahuaro covers an area of 120,000 square miles in Arizona and Sonora, no lack of raw material will be encountered in the application of this method of preparation."

Dr. N. L. Britton of the New York Botanical Garden describes in *Science* for March 24 the cotton found growing "in the extreme southern part of Jamaica in coastal thickets both in sand and on nearly level limestone rock where there is scarcely any soil." It was noticed over an area about a mile long and several hundred feet wide. Dr. Britton further says, "there is a total absence of weeds of cultivation, the cotton being associated with characteristic plants of the coastal lowlands. The flowers are small, the petals white with a crimson spot at the base, fading through the day to pink; the pods are small, nearly globular, the foliage pubescent or very nearly glabrous.

"There are no white residents at the place; the negroes say that the cotton was brought there in slavery times and planted, but the soil is such that no cultivation would be practicable and the remarkable absence of weeds indicates that no cultivation was attempted there; the negroes say that it was formerly collected and shipped. The occurrence of the plant at this place, associated only with native species, has given us a strong impression that it is indigenous though it may not be; at any rate it is a race

of cotton that has probably been quite unchanged from its pristine condition.

"It at once occurred to us that this race might prove a very valuable one for breeding purposes, inasmuch as it furnishes a new point of departure."

Dr. O. F. Cook's comment in the same number of *Science* is partly given below.

"Professor Britton's account of the conditions under which this primitive type of cotton grows would seem to establish beyond doubt that it is really a wild plant. The very small bolls and sparse lint would seem to preclude the idea that this cotton was introduced into the island for civilized agriculture. If not truly indigenous it must have been brought in aboriginal times, or by accident.

"The existence of wild cotton in Jamaica has been claimed by Macfayden and others, but the evidence has not been convincing. Macfayden described two species of cotton (*Gossypium jamaicense* and *G. oligospermum*) as native to Jamaica, but both are said to have yellow flowers and have been reckoned as forms of Sea Island cotton (*Gossypium barbadense*). White flowers are not known in any cottons of the Sea Island series. In the characters of the seeds and bolls Professor Britton's cotton closely resembles a type which grows wild on the Florida Keys."

NEWS ITEMS

Dr. J. M. Reade has been promoted from instructor to professor of botany at the University of Georgia.

Dr. Friedrich Hildebrand, professor of botany at Freiburg, recently celebrated the fiftieth anniversary of his doctorate.

Mr. W. W. Eggleston is making studies and collections of *Crataegus* in Virginia and North Carolina.

Professor G. W. Wilson, of Upper Iowa University, held a research scholarship at the New York Botanical Garden during the past summer.

Professor F. S. Earle, recently director of the Estación Agro-

nómica Central of Cuba, has accepted an appointment as agricultural specialist of the Cuban-American Sugar Company.

Dr. and Mrs. N. L. Britton left New York on August 22 for another botanical visit to the island of Jamaica. They expect to return about September 30.

Recent journals announce the death of Dr. Hermann Karston, the Berlin botanist, aged ninety-two years, and also that of Professor Daguillon, assistant professor of botany at the Sorbonne.

Dr. P. A. Rydberg, of the New York Botanical Garden staff, spent two weeks in the latter part of August in collecting in the Roan Mountain region of North Carolina and Tennessee.

Dr. Roland M. Harper gave a course of botanical lectures in July and August at the Biltmore Forest School, in North Carolina. He has since been carrying on botanical field-work in Georgia and Alabama.

In the distribution of the Bonaparte fund for 1908 by the Paris Academy of Sciences, the sum of 2,000 francs has been awarded to L. Blaringhem to enable him to continue his studies on the variation of species and the experimental methods of creating new species of plants.

The United States Forest Service has arranged for six sub-offices, to be situated in six cities which are centers of interest in forestry. Two of the cities selected are San Francisco and Denver, and one will probably be Portland; it is expected that offices will be opened in the states of Montana and Utah.

Fred Jay Seaver, M.Sc., assistant professor of botany in the North Dakota Agricultural College, has been appointed director of the laboratories of the New York Botanical Garden, succeeding Dr. C. Stuart Gager, who has accepted the professorship of botany in the University of Missouri. Mr. Seaver held the fellowship in botany in Columbia University during the year 1906–7 and was formerly professor of biology in the Iowa Wesleyan University.

TORREYA

October,* 1908

Vol. 8 No. 10.

A MIOCENE CYPRESS SWAMP

By Edward W. Berry

Bartram writing before the American Revolution has this to say of the cypress: "This Cypress is in the first order of North American trees. Its majestic stature is surprising. On approaching it we are struck with a kind of awe at beholding the stateliness of its trunk. . . . The delicacy of its color and the texture of its leaves exceed everything in vegetation . . . Prodigious butresses branch from the trunk on every side, each of which terminates underground in a very large, strong serpentine root, which strikes off and branches every way just under the surface of the earth, and from these roots grow woody cones, called Cypress knees, four, five and six feet high, and from six to eighteen inches and two feet in diameter at the base."

At the present time the bald cypress does not extend northward above latitude 39° which it almost reaches in both Delaware and Indiana. During the Pleistocene, however, following the final retreat of the ice it flourished considerably farther northward, buried cypress swamps of Pleistocene age being a feature of these and somewhat earlier deposits. They are exposed at innumerable points in our coastal plain from Maryland southward wherever the rivers have happened to cut into them, often exhibiting the remains of huge stumps with their wide-spreading roots and knees, the peaty matrix crowded with twigs, cone-scales, and seeds. It seems evident from this, and other evidence of a subfossil character, that at the present time the cypress is gradually becoming more restricted in its range. When we go back to

[No. 9, Vol. 8, Torreya, comprising pages 209–232, was issued September 26, 1908.]

* Dr. Gager's paper on Radioactivity and Life, which was to be a part of this number, will, unfortunately, have to be delayed.

the Tertiary period, however, a matter of a couple of million years or so, we find the cypress occupying a position to which its picturesque beauty entitles it, for its remains are found from Siberia and Spitzbergen across the arctic regions to Ellesmere Land, Greenland, and Alaska and southward over a large part of Asia, Europe, and America. Both Europe and Asia could claim it as a native plant up to the time the great glaciers came down from the north and forced it into the Mediterranean sea or against the fatal ice sheets that centered in the southern highlands of the Himalayas, Balkans, Alps, etc.

We in America have an almost unequalled series of early Tertiary deposits, but coming down to the latter half of that period we find our record much broken and scattered so that the botanist who would collect Miocene plants in any great variety must journey to Europe where there are innumerable localities of wide renown and great excellence.

Here in eastern North America our Miocene deposits are all marine and while they yield several hundred species of fossil shells often of exceeding great beauty, particularly in the Carolinas, they have only furnished thus far the scant remains of six species of fossil plants * preserved in a chance deposit in the District of Columbia.

Great interest therefore attaches to the recent discovery of indications of a cypress swamp along the ancient coastal estuaries of Virginia at a time when the diatomaceous deposits which now constitute the Calvert formation were being laid down off shore. During a recent visit to Richmond a considerable collection of fossil plants was made from these diatomaceous beds and a fair picture was obtained of some of the inhabitants of this far off cypress swamp.

First of all, the cypress twigs are preserved in greatest abundance, much broken to be sure, but indistinguishable as regards form and habit from their modern descendants. An occasional cone-scale was uncovered furnishing conclusive proof that we were not confusing cypress and sequoia, for a very abundant Tertiary

* An undescribed flora from southern New Jersey in the hands of Dr. Hollick may be of late Miocene age.

sequoia, *Sequoia Langsdorfii*, has twigs which greatly resemble those of the cypress. Then there were the seeds of the gum (*Nyssa*) showing that the tupelos were associated with the taxodiums even as far back as the Miocene. Along with the foregoing there was a species of willow (*Salix*) and one of water elm (*Planera*), another of water beech (*Carpinus*), an oak (*Quercus*) and an ash (*Fraxinus*), a fig (*Ficus*), and a button-ball (*Platanus*).

A large number of leaf fragments were unidentifiable as were also six or eight different varieties of seeds, but leaves of *Celastrus* were recognized as well as two kinds of leaflets of some members of the Leguminoseae. Another genus which was recognized was *Salvinia*.*

It has always been a matter for wonderment that these great beds of diatoms could have been laid down and remain so free from land-derived sediments unless they were deposited in deep water far from any shore, which seemed improbable. The fossil plants just mentioned help us to a probable solution of this problem for they point unmistakably to the existence of cypress swamps and these in turn indicate that the land was low with sluggish and meandering streams so that the amount of sediment carried was reduced to a minimum or what was carried was entirely strained off, only the impalpably fine sediment which to-day makes the diatomaceous earth so argillaceous in places, succeeding in reaching the areas where the diatom skeletons were being deposited.

Johns Hopkins University.

* A complete account of this flora is in course of publication.

SHORTER NOTES

Nomenclature.— The constant discussion now in progress concerning nomenclature may add to the interest of the following extract from Dr. George Sumner's leisurely treatment of the subject in his book entitled "A Compendium of Physiological and Systematic Botany" published at Hartford in 1820:

"In all ages it has been customary to dedicate certain plants to the honor of distinguished persons. Thus *Euphorbia* commemorates the physician of Juba, a Moorish prince, and *Gentiana* immortalizes a king of Illyria. The scientific botanists of modern times have adopted the same mode of preserving the memory of benefactors to their science; and though the honor may have been sometimes extended too far, that is no argument for its total abrogation. Some uncouth names thus unavoidably deform our botanical books; but this is often effaced by the merit of their owners, and it is allowable to model them into grace as much as possible.

"Linnaeus has in several instances drawn a fanciful analogy between botanists and their appropriate plants, thus —

Bauhinia, after the two distinguished brothers, John and Caspar Bauhin, has a two-lobed or twin leaf.

Scheuchzeria, a grassy Alpine plant, commemorates the two Scheuchzers, one of whom excelled in the knowledge of Alpine productions, the other in that of Grasses.

Dorstenia, with its obsolete flowers, devoid of all beauty, alludes to the antiquated and uncouth book of Dorstenius.

Hernandia, an American plant, the most beautiful of all trees in its foliage, but furnished with trifling blossoms, bears the name of a botanist highly favored by fortune, and allowed an ample salary for the purpose of investigating the Natural History of the Western world, but whose labors have not answered the expense. On the contrary

Magnolia with its noble leaves and flowers, and

Dillenia, with its beautiful blossoms and fruit, serve to immortalize two of the most meritorious among botanists.

Linnaea, "a depressed, abject, Lapland (and American)

plant, long overlooked, flowering at an early age, was named by Gronovius after its prototype Linnaeus."

Specific names should be formed on similar principles to the generic ones; but some exceptions are allowed, not only without inconvenience, but with great advantage. Such as express the essential specific character are unexceptionable; but perhaps those which express something certain, but not comprehended in that character, are still more useful, as conveying additional information, for which reason it is often useful that vernacular names should not be mere translations of the Latin ones.

"Botanists occasionally adapt a specific name to some historical fact belonging to the plant or to the person whose name it bears, as *Linnaea borealis* from the great botanist of the north; *Murraea exotica* after one of his favorite pupils, a foreigner; *Browallia demissa* and *elata*, from a botanist of humble origin and character, who afterwards became a lofty bishop, and in whose work upon water I find the following quotation from Seneca in the hand-writing of Linnaeus: 'Many might attain wisdom if they did not suppose they had already attained it.' In like manner *Buffonia tenuifolia* is well known to be a satire on the *slender* botanical pretensions of the great French zoölogist, as the *Hillia parasitica* of Jacquin, though perhaps not meant, is an equally just one upon our pompous Sir John Hill. I mean not to approve of such satires. They stain the purity of our lovely science. If a botanist does not deserve commemoration, let him sink peaceably into oblivion. It savours of malignity to make his crown a crown of thorns, and if the application be unjust, it is truly diabolical."

Jean Broadhurst.

Teachers College.

REVIEWS.

Beccari's American Palms

Le Palme Americane della Tribu delle Corypheae. Odoardo Beccari. (Extracted from Webbia, vol. 2, Florence, 1907.)

In this valuable monograph Professor Beccari presents the results of many years investigation of palms and his work will be of immense interest and great assistance to students of these plants. In the tribe *Corypheae*, discussed in this volume, the American species are included in the following genera :

1. *Sabal* Adans. In this genus he recognizes eighteen species distributed from North Carolina to Porto Rico and Guatemala. He divides the genus into four series according to the size and shape of the fruit. Our observations indicate that the size of the fruit is not a good character to use, inasmuch as it varies greatly ; the shape of the fruit is, however, apparently constant. He properly, in my opinion, declines to accept the genus *Inodes* Cook, which has as its only available character a tall upright trunk rather than the short and mostly subterranean one of *S. glabra* (Mill.) Sargent, the type species. From my knowledge of these trees in the field, I conclude that he has recognized one or two species too many. *Sabal Schwarzii* (Cook) Beccari, of Florida, has no chance to be specifically distinct from *Sabal Palmetto* (Walter) Lodd.; *Sabal Palmetto bahamensis* does not differ sufficiently from the type, if at all, to be entitled to recognition in nomenclature ; *Sabal florida* Beccari, from Cuba, differs slightly from *S. Palmetto* in that the branchlets of the inflorescence are thicker, but the flowers, according to our dissections, are essentially identical. No mention is made of the Jamaica *Sabal*, very common in parts of that island, and sometimes attaining a height of 25 meters ; its flowers are like those of *Sabal parviflora* Becc. of southern Cuba.

2. *Serenoa* Hook. f. This consists entirely of *S. serrulata* (Michx.) Hook. f., of the southern United States.

3. *Brahea* Mart. Here four species are recognized, three of them Mexican and one from San Salvador.

4. *Acoelorraphe* Wendl. This generic name, published without a type in 1879, and therefore a hyponym, must give way to the generic name *Paurotis* Cook, Mem. Torrey Club **12**: 21. 1902, not mentioned by Professor Beccari. He recognizes two species, one from Cuba, the other from Florida, which do not seem to us to be distinct, and his descriptions call only for differences in the foliage. The genus is made up of the following elements: (*a*) *Copernicia Wrightii* Griseb. & Wendl., from Cuba; (*b*) *Serenoa arborescens* Sarg., from Florida; and (*c*) *Paurotis androsana* Cook, from the Bahamas. In my opinion these represent but one species, and the oldest name for it is *Wrightii*.

5. *Erythea* S. Wats. Four species are recognized from northern Mexico and Lower California.

6. *Copernicia* Mart. Nine species are recognized, five of them from South America and four from Cuba, including a proposed *C. Curtissii* from the Isle of Pines, which differs very slightly from the well-known *C. hospita* Mart. In this connection it is to be hoped that some light may be thrown on the record by Grisebach for the island of Jamaica of *Copernicia tectorum* Mart., otherwise known only from Venezuela, though erroneously attributed by Grisebach to Hayti. Careful search in Jamaica by Mr. Harris and by me has hitherto failed to reveal the presence there of any species of this genus, though it is possible that one may yet be found there. Professor Beccari evidently did not completely understand Dr. Morong's descriptions of *Copernicia alba* and *Copernicia rubra* from Paraguay, in Ann. N. Y. Acad. Sci. **7**: 245, or he might have used one of these names for the plant he proposes as *C. australis*, even if they are not specifically distinct.

7. *Washingtonia* Wendl. In this genus of southern California, Lower California, and Sonora, the three previously published species are recognized, together with two additional varieties, although he regards *W. Sonorae* as dubious and to be compared with *W. robusta*. He does not cite the equivalent names under *Neowashingtonia*, proposed some years ago by Mr. Sudworth, and makes no mention of *Washingtonia* Wendl. being a homonym; it is a homonym, however, and a revertible one.

8. *Pritchardia* Seem. & Wendl. To this genus, which has eight recognized species in the Pacific islands (*P. pacifica* Seem. & Wendl. the type), Professor Beccari joins *Colpothrinax Wrightii* Griseb. & Wendl. of Cuba. We do not believe that this disposition of the Cuban tree can be satisfactorily maintained, notwithstanding the apparently slight generic differences shown by the fruit.

9. *Rhapidophyllum* Wendl. consists wholly of *R. Hystrix* (Fraser) Wendl. of the southeastern United States.

10. *Trithrinax* Mart. consists of five species from southern Brazil, eastern Bolivia, Paraguay, and the Argentine Republic.

11. *Acanthorhiza* Wendl. Two species are recognized, one from southern Mexico, the other from Panama, Costa Rica, and Nicaragua.

12. *Hemithrinax* Hook. f. consists wholly of *H. compacta* (Griseb.) Hook. f. from Cuba, known only from its original collection by Charles Wright.

13. *Thrinax* Sw. This is probably the most difficult of the American palm genera to understand, inasmuch as the foliage of most species is very similar and the differences in flowers and fruit are very slight. Professor Beccari accepts ten species, four of which he describes as new from Cuba, and discusses three dubious species. *T. microcarpa* Sarg., of Florida, *T. keyensis* Sarg., of Florida, *T. ponceana* Cook, of Porto Rico, and *T. bahamensis* Cook, of the Bahamas, I have studied in the field and regard them as one; *T. punctulata* Beccari, of Cuba, is very closely related, if not to be included in this aggregate. *T. tessellata* Beccari, from Jamaica (erroneously cited in Professor Beccari's key to the species as from Cuba) seems very distinct. *T. parviflora* Sw., of Jamaica, the type species, has very close congeners in *T. floridana* Sarg., of Florida, and *T. Wendlandiana*, of Cuba. *Thrinax excelsa* Lodd., as described by Grisebach, from Jamaica, is abundant on that island and distinct from *T. parviflora*, to which it is doubtfully referred by Beccari.

14. *Coccothrinax* Sarg. This genus, very distinct from *Thrinax* by the grooved endosperm of the fruit, has as synonyms *Thrincoma* Cook and *Thringis* Cook. Professor Beccari admits thir-

teen species, making his primary division of the genus on the number of the segments of the leaf and their relative length to the undivided part, a character which fails altogether in life, the leaves of young plants of species of this genus being often quite different from those borne by old trees, as may be readily seen in the Bahamas and in Jamaica. *C. argentea* (Lodd.) Sarg., the oldest species included in the genus, is restricted by Beccari to the island of Santo Domingo, and, according to him, little is known of it at the present time. In my studies I have been unable to satisfy myself as to the origin of the plant listed by Loddiges as *Thrinax argentea*, and I am not clear from Professor Beccari's discussion of the subject that it really came from that island. The Index Kewensis attributes it to Panama. On the other hand, the plant described by Professor Sargent from Florida as *C. jucunda* in 1899, and which, from my observation, has a wide range in the West Indies, throughout the Bahamas to the island of Culebra and to Jamaica, is more likely to be the true *T. argentea*. I am also unable to separate specifically from this species, the *C. Garberi* (Chapm.) Sarg., of southern Florida, as it seems to differ only in being smaller. In the collections made by Mr. Nash in the pine forests of the mountains of Hayti there is a species of *Coccothrinax* which appears to be wholly distinct from anything recorded by Professor Beccari.

15. *Crysophila nana* (H.B.K.) Blume, from southern Mexico, is regarded as dubious.

The volume will stimulate the study of American palms. A considerable number of the species are as yet known only from single collections of herbarium specimens and further collections will be needed, together with field observations and the study of living plants in conservatories, to establish them as valid. Meanwhile we thank Professor Beccari for his important contribution.

N. L. Britton.

SOME SIMPLE PHYSIOLOGICAL APPARATUS

By George E. Stone

The writer has for many years conducted a physiological practicum connected with botanical teaching, and as might be expected in any course requiring experiments, many methods and devices have been incidentally developed, some of which have proved fairly satisfactory in demonstrating certain principles, and others may find them suggestive in their lines of work.

Method of Demonstrating Difference in Transpiration Between Upper and Lower Sides of the Leaf

For demonstrating the difference in transpiration between the upper and lower sides of the leaves we have used the apparatus shown in figures 1 and 2, which illustrate a calla plant with the apparatus in place. It consists of two simple hygrometers 5 cm. in diameter, similar to those often used in cigar cases. These are attached to two pieces of metal tubing slightly larger in diameter than the hygrometers, each tube being about 4.5 cm. long. The hygrometers are placed in the end of each tube by means of rubber sheeting cut so as to fit tightly around the hygrometers. The rubber is then turned over the end of the metal and tied on with a thread. The tubes containing the hygrometers are placed on either side of the leaf, the ends of the tubes being supplied with rubber rings or bands so that the two halves of the metal cylinder, each containing the hygrometer, can be pressed against the leaf firmly but without injuring it. Glass tubes or even large corks may be substituted for metal if the proper size is obtainable. By taking readings of both hygrometers at the beginning of the experiment and at different times afterwards the relative difference in the transpiration between the upper and lower sides of the leaf is fairly accurately determined.

Method of Demonstrating the Effects of Various Factors on Transpiration

There are many simple experiments which may be done to illustrate the effects of various factors on transpiration. In our

FIG. 1. Method of demonstrating the difference in transpiration between the upper and under side of the leaf by means of hygrometers.

laboratory we have for a number of years made use of the apparatus illustrated in figure 3, which consists of a wooden stand mounted on legs, as shown in the illustration. This stand supports a large bell glass containing two apertures and in the center of the wooden stand there is a hole about one-half inch in diameter through which the plant is inserted into a tube below. The stem of the plant is forced down through the cork stopper into the tube containing water. A piece of flexible rubber cloth is tied around the bottom of the bell glass. The stem of the plant is put through a slit in the rubber cloth which is fastened to the plant securely by means of thread. From the lower end of the larger tube containing the stem of the plant

there are two small glass tubes bent at right angles at the extreme end which are attached to a meter stick, the lower ends of which are submerged in a vessel of water. One of these tubes has a calibre of about three millimeters in diameter; the other of about one millimeter or more. If the plant is transpiring very

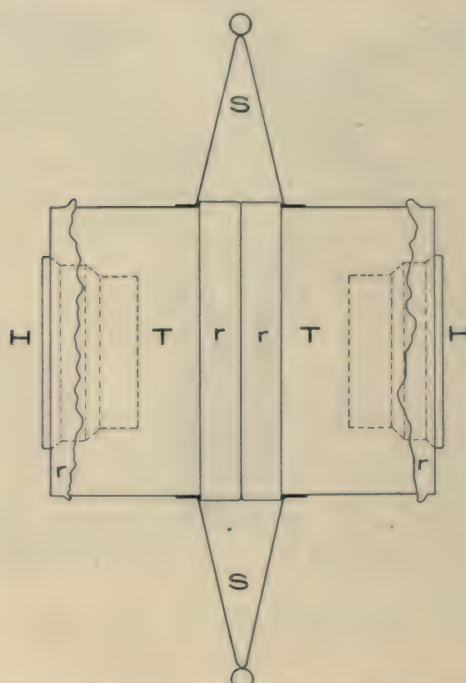

FIG. 2. Cross-section of transpiration apparatus. *T*, Metal tubes holding hygrometers. *H*, Hygrometers. *S*, Springs which hold the tubes close to the leaf. *r*, Rubber sheeting and bands.

freely the larger tube can be used, but if transpiring only slightly the smaller one will answer the purpose better. Connected with the large tube containing the stem is a reservoir or supply of water which is for the purpose of enabling the bubble to be placed anywhere on the scale desired by letting in water or by sucking it upwards. We have used this apparatus now for many years with considerable success. For our purpose we attach the bell-glass to a Chapman aspirator which enables one to draw air

of various degrees of saturation through the chamber, and by means of the bubbles the rate of transpiration can be determined. One can demonstrate the effects of ordinary laboratory air on transpiration or the effects of dry and moist air. The effects of dry air may best be determined by aspirating through sulfuric acid, which is much superior to calcium chloride. The effects of moist air may so be demonstrated by passing the air through water bottles, and the effects of warm air by heating very thoroughly a piece of gas pipe over a flame and aspirating air through it. In carrying on the various experiments a thermometer and

FIG. 3. Method of demonstrating effects of various factors on transpiration.

hygrometers may be placed under a bell-glass to indicate the changes in the air. This apparatus may be used to demonstrate the effects of chloroform, ether, illuminating gas, etc. on transpiration, and by the use of a simple mechanism the effects of movements or vibrations on the plant in the bell-glass may be determined, and in short, this apparatus may be used to demonstrate most of the fundamental factors underlying transpiration.

Devices for Percolating Air Through Soils

There is on the market a standard set of appliances adapted to the study of soil physics. Simple experiments to demonstrate the percolation of air and water through soils, capillarity, water retaining capacity, etc., are of value in connection with the study of respiration. An appliance is often used in connection with the experiments relating to the percolation of air through soils which is defective and unreliable, and the writer has made

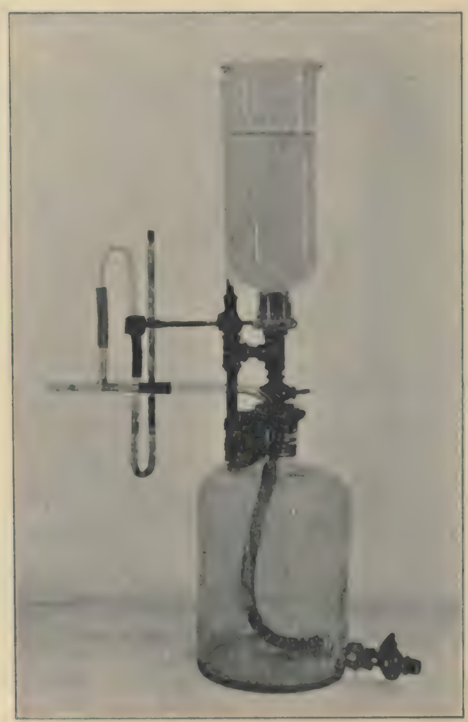

Fig. 4. Device for percolating air through soils.

use for a number of years of a form similar to that shown in figure 4. The principles underlying the present device for demonstrating the percolation of air through soils are not perfect, but the defects are of more theoretical than practical importance and could be easily remedied if necessary. The device

consists of a bottle holding about two gallons with an opening at the bottom provided with a valve. This is connected with a bell-jar overhead holding about a liter and a half, and in the operation one liter of water is allowed to pass very slowly from the jar above into the lower one. This causes a displacement of air; in other words, one liter of air in the lower jar is forced out through the tube shown at the left into the soil and the length of time it takes this liter of air to pass through certain soils is recorded. By using soils of different texture different values are obtained. The soils in an experiment of this nature are usually placed in metal cylinders of about 500 c.c. capacity, but lamp chimneys provided with corks at the bottom may be substituted, if necessary.

Connecting the tube with the lower jar there is a water manometer containing an inch or two of water in each arm, which determines the pressure of the air due to resistance to pressure through the soil, and when one liter of air is passed from the upper bell-jar into the jar below and the water columns remain precisely on a level, exactly one liter of air has been passed through the soil. The contrivances often used for this purpose are so clumsy and constructed on such poor mechanical principles that it is impossible to get the same results from the same soil twice, but by the use of the device described above, very reliable results are obtainable.

Massachusetts Agricultural College.

Mr. J. A. Udden, of Rock Island, Illinois, reports in *Science* for July 31, a fossil cycad found in the Upper Cretaceous of Texas Eight fragments of what was presumably the same silicified trunk were found, three of these matched by their fractures and showed a stem about ten inches wide, hollow, and considerably flattened.

The *Century* for September has an illustrated article on the Future Wheat Supply of the United States, written by Edward C. Parker, Assistant at the Agricultural Experiment Station of the University of Minnesota. The methods of the wheat breeder are clearly described, and besides the economic information indi-

cated by the title the article contains a discussion of spring and winter wheats, rotation of crops, etc.

The Forest Service has issued a bulletin announcing that the supply of dogwood and persimmon in the southern States is nearly exhausted. These woods furnish, it is said, the entire supply of bobbins, shuttles, and spindles used in the cotton and woolen mills. Dogwood is said to be the only wood which takes a high polish and wears perfectly smooth by friction under water. Two large plants for the manufacture of bobbins and shuttles have been erected in Oregon, where the dogwood forests are the greatest in the world, the trees often reaching a height of 75 feet. Eastern manufacturers, however, are trying to find satisfactory substitutes nearer home, the most promising of which is probably the tupelo gum.

The *New York Tribune* announces that visitors to California will "have access to a third forest of giant redwoods when the counties of Tulare and Fresno complete construction of twenty-five miles of highway between Visalia and Redwood Canyon, in the Kings River country, where there is a grove of over fifteen thousand magnificent specimens of the Sequoia gigantea, many of which are said to compare in size and beauty with the trees of the Mariposa and Calaveras groups. It is probable that the property, which is as yet untouched by lumbermen, will be recommended to Congress for purchase as a national park. One tree in the redwood grove, recently measured by a government ranger, is 110 feet in circumference and is estimated to contain 800,000 feet of lumber. A claim is made that a fallen giant in the region is the largest in the country. Located at an altitude of less than six thousand feet, the canyon would be accessible for a longer period than the other giant groves in the state."

The *Plant World* for June contains a paper on stomata by Professor Francis E. Lloyd. The study upon which the article is based extended over the major part of three years. In order to determine the relation between transpiration and the size of the

openings, "it is necessary to be able to determine the rate of transpiration and the size of the stomatal openings independently at the same instant of time. It is obvious that we may neither judge the rate of transpiration from the size of the openings, nor the size of the openings from the rate of transpiration. How to do this was the difficult task, but with a sufficiently small error, this was done in the following manner:

"It was found that the stomata of certain, and probably many, plants may be fixed in the form in which they are found in life by tearing off the epidermis and plunging it into absolute alcohol. The distortion of the stomata caused by the tearing is only temporary, the guard cells recovering their form just as a rubber ball does when it has been released from pressure. The alcohol extracts the water from the cell-walls, thus rendering them rigid, and this it does so rapidly that they do not have a chance to lose the water contained within the protoplast while the walls are still pliable, a process which would result in closure."

Many series of experiments, mostly with the ocotillo, *Fouquieria splendens*, under varying conditions as to light, heat, humidity, etc., have led Professor Lloyd to the following conclusions: "With little or no movement in the stomata, and therefore with little change in the size of their openings, wide fluctuations in the rate of transpiration may and do occur;" and further, the evidence now in hand on the plants studied does not support the view that stomata are regulators of transpiration. "These are not markedly desert types as far as the stomata are concerned, and the amount of water-vapor which may escape through one type of stoma per unit of time may be greater or less than that which may escape through another type. The structure of the stoma, as that of other organs, may indeed explain why some plants are able to get along in the desert, and others not. Stomata of a given form may act as a dampener on transpiration, just as, using an analogy, the mute in a cornet reduces the amount of sound which emerges from the instrument. But the mute does not regulate the sound, causing now more and now less in successive intervals of time. In this sense, also, stomata cannot be said to regulate the flow of water-vapor from the leaf. Nor do they 'anticipate' wilting, the

closure of stomata during this process being as much a result of the wilting as the flaccidity of the other cells of the leaf. We must therefore give up for the present the long cherished notion that stomata are delicate valves opening and closing rapidly to modify the rate of transpiration as the needs of the plant indicate."

An interesting article on the manufacture and consumption of pulp wood* is given in *Science* for July 24: "The advance statement is made from the statistics collected by the Census Bureau in coöperation with the United States Forest Service. Many of the figures bring out interesting facts which show the rapid growth of the paper-making and allied industries during the last decade. Nearly four million cords of wood, in exact numbers 3,962,660 cords, were used in the United States in the manufacture of paper pulp last year," and over "two and one half million tons of pulp were produced. The pulp mills used 300,000 more cords of wood in 1907 than in the previous year. The amount of spruce used was 68 per cent. of the total consumption of pulp wood, or 2,700,000 cords. The increased price of spruce has turned the attention of paper manufacturers to a number of other woods, hemlock ranking next, with 576,000 cords, or 14 per cent. of the total consumption. More than 9 per cent. was poplar, and the remainder consisted of relatively small amounts of pine, cottonwood, balsam and other woods. There was a marked increase last year in the importation of spruce, which has always been the most popular wood for pulp. For a number of years pulp manufacturers of this country have been heavily importing spruce from Canada, since the available supply of this wood in the north-central and New England States.

* According to the New York Tribune for September 18, the Congressional committee appointed to investigate conditions in the paper mill and pulp industry reports plenty of pulp wood in the Middle West. One of the most important witnesses interviewed was William S. Taylor, president of the Pulp Wood Supply Company of Appleton, which organization furnishes pulp wood for twelve of the paper mills in the Fox River Valley; he stated that "his company buys about 225,000 cords of pulp wood annually, about 50 per cent. being spruce, most of which is purchased in Minnesota, and about 50 per cent. being hemlock, all of which is purchased in Wisconsin." Mr. Taylor is confident that "neither the present nor the coming generation need have any worry about the supply of pulp in the Middle West, for there are millions upon millions of feet available.".

where most of the pulp mills are located, is not equal to the demand."

The statement is made that only a "slightly greater amount of domestic spruce was used than in 1906. Large quantities of hemlock were used by the Wisconsin pulp mills, and the report shows that the Beaver State now ranks third in pulp production, New York and Maine ranking first and second, respectively. Poplar has been used for a long time in the manufacture of high-grade paper, but the supply of this wood is limited and the consumption of it has not increased rapidly. Wood pulp is usually made by either one of two general processes, mechanical or chemical. In the mechanical process the wood, after being cut into suitable sizes and barked, is held against revolving grindstones in a stream of water and thus reduced to pulp. In the chemical process the barked wood is reduced to chips and cooked in large digesters with chemicals which destroy the cementing material of the fibers and leave practically pure cellulose. This is then washed and screened to render it suitable for paper making. The chemicals ordinarily used are either bisulphite of lime or caustic soda. A little over half of the pulp manufactured last year was made by the sulphite process, and about one third by the mechanical process, the remainder being produced by the soda process. Much of the mechanical pulp, or ground wood, as it is commonly called, is used in the making of newspaper. It is never used alone in making white paper, but always mixed with some sulphite fiber to give the paper strength. A cord of wood ordinarily yields about one ton of mechanical pulp or about one half ton of chemical pulp."

NEWS ITEMS

Dr. Raymond H. Pond has been appointed biologist of the Metropolitan Sewerage Commission of New York.

The death of Dr. Hermann Settegast, aged ninety years, professor of agriculture at Berlin, has recently been announced.

Miss Margaret A. Kingsley, a graduate of Smith College, 1908, has been appointed assistant in botany at Barnard College, Columbia University.

The University of North Carolina has just completed a new $35,000 biological laboratory; associate professor W. C. Coker has been promoted to professor of botany.

Dr. William Mansfield, treasurer of the Torrey Botanical Club, has been advanced to the professorship of pharmacognosy in the College of Pharmacy of Columbia University.

Washburn College, Topeka, Kansas, has just established a department of botany and zoölogy; Dr. Ira D. Cardiff, of the University of Utah, will have charge of the botany.

H. J. Eustace, at one time assistant botanist at the New York Agricultural Experiment Station at Geneva, New York, has been appointed professor of horticulture in the Michigan Agricultural College and horticulturist of the experiment station. He graduated at the Michigan Agricultural College in 1901.

Mr. Alvah A. Eaton died at North Easton, Mass., on September 29, aged 43 years. He was the author of numerous papers on the Pteridophyta and contributed the treatment of *Equisetum* and *Isoëtes* to the recently published "Gray's New Manual of Botany." For the past six years he had been collector and assistant to Mr. Oakes Ames of the Ames Botanical Laboratory at North Easton. In this connection he made several expeditions to Florida in search of orchids.

The Torrey Club expects to have a lecture by Dr. J. C. Bose, professor in the University of Calcutta, India, author of "Response in the Living and Non-living," "Plant Response, as a Means of Physiological Investigation" and of "Comparative Electrophysiology," during his visit to this country during October and November. Dr. Bose wishes to visit the more prominent institutions of the east and middle west, and will be very glad to lecture on his researches free of charge to university audiences or before scientific societies. He may be addressed in care of Mr. R. N. Tagore, Box 135, University Station, Urbana, Illinois.

TORREYA

November, 1908

Vol. 8. No. 11.

THREE RARE MYXOMYCETES

By Henry C. Beardslee

Three of our rarest and most interesting species of slime moulds are doubtless *Cribraria violacea* Rex and *C. minutissima* Schw. and *Clastoderma DeBaryanum* Blytt. It has been my good fortune to observe all three of these in some abundance and the following notes are given in the hope that they may be of interest.

My first acquaintance with *Cribraria violacea* was made while working at the Illinois Biological Station at Havana, Illinois. A very few scattering plants were first found on some bits of wood which had been brought into the laboratory on account of an entirely different species which was growing upon them. The specimens were unmistakable and proved the forerunners of more abundant collections. Once it became apparent that this dainty species was to be found, close examination revealed it, never in large quantities, but so generally distributed in my collecting grounds that it became apparent that its "rarity" there was due merely to its minuteness; for it can scarcely be detected, as it ordinarily occurs, without the use of a lens. A few weeks later it was found under very different circumstances. My attention was called to an old log which was declared to have a violet metallic sheen. Upon examination the log proved to have a beautiful iridescence, which was visible in a bright light at a distance of several feet, due to the presence of an enormous colony of this rare plant, which had completely covered the surface of the log in such abundance as to impart its peculiar color to it. Doubtless this one log had upon its surface more of this species than has been observed elsewhere in the world. It was certainly an

[No. 10, Vol. 8, of Torreya, comprising pages 233–252, was issued October 22, 1908.]

inspiring sight for a mycologist. Rex stated that the plasmodium of this species is deep violet-black, but unfortunately no trace of plasmodium could be seen on or in the log to verify this. About five stations for this species are reported.

During the same summer *Clastoderma DeBaryanum* was found at the same place. This species is also difficult of detection, though in a different way. The sporangium is globose, less than a fifth of a millimeter in diameter, mounted upon a stalk as fine as gossamer. When dry it is difficult of detection, and even when seen may readily be passed by under the impression that it is a mould.

A few scattering specimens were first found, but later a log was found and kept under observation which seemed to be completely filled with its plasmodium. This appeared at frequent intervals, covering the log with a pale yellow network of plasmodial threads, changing over night to a thick growth of the delicate sporangia. So far as I know this is the only time that its plasmodium has been observed with certainty. Later this species was found in Ohio and in North Carolina.

During the past summer the third species noted, *Cribraria minutissima*, was found in North Carolina, near Asheville. This seems the daintiest and most elusive of the Cribrarias. It is so minute that even after it has been found and mounted in the herbarium it is difficult to detect the delicate sporangia on the bit of wood which has been mounted. It seems to be fairly common at Asheville, but it is our most difficult species to locate.

Two facts doubtless account for the few recorded stations of these three plants. Their small size manifestly is one of these reasons. Upon an old log in dense woods each of them will defy any but the very closest scrutiny. In addition, it must be kept in mind that it is only when the sporangia have been formed that they are visible at all, and while the plasmodium may be present in large quantity, the period in which the sporangia are formed may be so short that it is easily missed.

At Havana, for instance, the beach along the Illinois River was thickly covered with old decorticated logs. These were examined regularly through the summer, three times a week.

Occasionally a few species of Myxomycetes were found in varying abundance, but usually they furnished a barren collecting ground. On one morning these logs everywhere along the river were found to be thickly covered with *Comatricha laxa* Rost. and *Enerthenema elegans* Bowm.

An endless amount of both species could have been gathered. Other occasions were apparently just as favorable, but at no other time did either species appear during that summer or the next.

It is easy to understand from an occurrence like this that a species may be present in large quantities in the plasmodial state and still fail to be observed even by a careful collector. Such a plant as *Cribraria violacea*, which has been detected at half a dozen stations stretching from Germany to Illinois, is in all probability general in its occurrence, but for the reasons given has failed as yet to be widely detected.

Asheville School,
Asheville, N. C.

A TRAGEDY OF THE FOREST*

In the forests of tropical regions, where vegetable growth is rank and the resulting strife for supremacy very keen, many plants are forced to find a home upon the trunks and branches of trees. Among these are the greater part of the orchids and bromeliads, and many of the aroids, ferns, and hepatics of these regions, which thus often clothe the trunks and branches with a living mantle. Such, however, are harmless, for they work no injury to the trees which furnish them a home. But there are others which are not of this harmless nature. These have their beginnings as weak epiphytes, and from guests rapidly develop into masters, finally destroying the tree which gave them friendly shelter when young.

If you ever visit a tropical forest, seek for some of these. It will not take a long hunt to find one. Look in the crotch of some tree or on the stump left by some broken limb, or wherever a bit of humus has collected to furnish a foothold for the seed, and you may see a small plant, perhaps but a few inches or a foot

* Illustrated with the aid of the McManes fund.

or so high, with a few large obovate fleshy leaves. Descending from the lower part of the stem you will usually find a few long roots, harmless looking and in appearance much like dangling ropes. Here is the beginning of a tragedy, for unless something

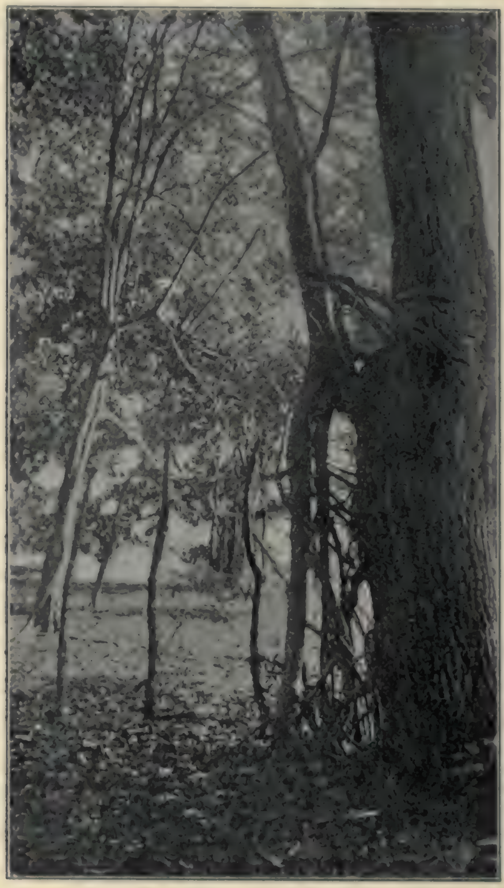

FIG. 1. The *Clusia* forming a trunk and sending out lateral roots.

happens to kill this young plant, the tree upon which it has found a resting place is surely doomed.

It is some time before the fate of the foster-tree becomes evident, for the long roots must reach the ground and increase in diameter, several of them finally forming the trunk of the new

tree. On the left-hand side of the trunk of the tree, in the first illustration accompanying this article, where a limb has been broken away, one of these plants may be seen. Not only do roots descend, but some of them throw themselves around the tree, a

FIG. 2. The *Clusia* firmly established and lashed to the supporting tree.

feature clearly shown in the same illustration. The new tree is small as compared with its foster-parent, but look at the second and third illustrations which depict more advanced stages of the tragedy. In the former note how large have become the trunk-like roots and how many other roots have surrounded the trunk of

the foster-tree like great tentacles which are slowly but surely strangling it. It is but a short step now to the end, for soon the tree, which gave support and a home to the baby plant, loses its life, finally going into decay and falling away, leaving its one-time epiphytic guest master of the situation.

FIG. 3. A *Clusia* from Jamaica. (Photograph loaned by Dr. M. A. Howe.)

This is the tragedy as I saw it enacted many times in the forests of Haïti, where two of the photographs were taken from which the illustrations were made. The scene is laid on the north side of the island, about eighteen miles to the west of Cap Haïtien,

and not far from the little village of Port Margot. It is not necessary that you visit that particular locality, for nearly anywhere in a tropical forest you may see the same thing taking place. In this instance the ungrateful plant was *Clusia*, but there are other plants * which gain their ends in the same way. No wonder that in the English-speaking portions of the West Indies this plant has received the name of the "Scotch attorney," for when it once obtains a hold it never lets go while there is anything to be gained.

GEORGE V. NASH.

NEW YORK BOTANICAL GARDEN.

REVIEWS

"Gray's Manual," Seventh Edition †

The long anticipated seventh edition of "Gray's Manual" has appeared, and proves to be an attractive and carefully prepared work of 926 pages, quite copiously illustrated with small but generally clear and accurate figures scattered throughout the text. The arrangement followed is that of Engler & Prantl, and the plan of prefacing the treatment of the species in a genus with a specific key is generally adopted. The authors, or editors as they designate themselves, Professors B. L. Robinson and M. L. Fernald, of Harvard University, are to be cordially and sincerely congratulated on the successful termination of their work, which not only exhibits on every page the learning for which the authors are so well known, but shows every evidence of painstaking care and an evident desire to embody the latest researches

* The last report of the Missouri Botanical Garden has an illustrated paper on "The Florida Strangling Figs" by Dr. Ernst A. Bessey. Two species of *Ficus* are described; one (*F. aurea*) having the curious "habit of beginning its growth as an epiphyte and later becoming terrestrial by sending down numerous slender roots which eventually thicken and fuse together, finally wholly surrounding and strangling the host." The seeds of the same species require light in order to germinate; this peculiarity is no doubt related to its epiphytic habit. — EDITOR.

† Gray's New Manual of Botany (Seventh Edition — Illustrated). A Handbook of the Flowering Plants and Ferns of the Central and Northeastern United States and adjacent Canada. Rearranged and extensively revised by Benjamin Lincoln Robinson and Merritt Lyndon Fernald. Pp. 926. f. 1–1036. American Book Company, New York, 1908. $2.50. [Issued September 18.]

in the flora of the region covered. The belief which has prevailed in botanical circles in the past, whether rightly or wrongly, that propositions put forward by others would not be investigated solely on their merits by the Harvard botanists — a belief which the sixth edition of Gray's Manual unfortunately did so much to foster — will now happily have to disappear and be but a memory of the days that were.

By the above statements the writer does not, of course, mean that there are not many features in this edition of "Gray's Manual" open to criticism and strong differences of opinion, and no one will probably admit this more readily than the learned authors themselves. The first and probably the most obvious question, which will occur to any one after a careful perusal of this work, is why it is called "Gray's Manual." One can understand that as a commercial proposition it may have been deemed advisable to conserve the value of the advertising given to Gray's works in the past. Apart from this, however, there is so little left of the text of the old Gray's Manual, and the entire arrangement, nomenclature, style, type, and even cover of the book, have been so radically and fundamentally changed, that it seems to the writer a misuse of terms to speak of this work as a new edition of Gray's Manual. Indeed, so vast are the changes that the writer feels called upon to offer his condolences to those Bostonians of the old school for whom even the phraseology of the former editions of Gray's Manual has been almost sacred. In the present work they will find so much that is new that he is almost afraid they will be compelled to fall back on Dr. Britton's Manual to be again on familiar ground! To be serious, however, the authors are doing themselves an injustice in not calling the work what it really is. It is so nearly a new work that in accuracy it should be called "Robinson & Fernald's Manual." If the authors are too modest for this, calling it "Britton's Manual — Harvard Edition," would be more accurate than using the name which has been given, as in every respect it much more resembles Dr. Britton's work than it does Dr. Gray's.

In matters of nomenclature, the work unfortunately follows the arbitrary and unjust Vienna Code, not because the learned

authors believe in that code, but because they hope to keep American botany from an alleged "provincialism" in not following it. Americans in general, and Bostonians in particular, have in times past shown pronounced evidences of "provincialism" when dealing with certain European ideas of right and wrong, and the writer for one hopes that a similar "provincialism" will be shown in dealing with the Vienna Code. To select arbitrarily several hundred generic names as that Code does, and refuse to recognize them, although entitled to recognition under every rule of right and justice, is to the writer one of the most indefensible of propositions. The writer, of course, knows that the rule referred to is not one for which the authors of the work under review are responsible. He only hopes that, with the liberal mind they have shown in dealing with other questions, they will in the future join other American botanists in repudiating it.

Outside of the changes made necessary by recent discoveries, a very large percentage of the differences between this manual and other manuals of recent years, arises from this arbitrary rejection of certain generic names. The rejection of the rule "once a synonym, always a synonym" accounts for a small percentage of the differences, and the remaining arise almost entirely from what might be called a "conservative" generic treatment. Indeed, the generic treatment is rather disappointing. The authors have not given us their own ideas, as they have in the case of species, but have followed too closely the ideas of others. The same liberal treatment which the authors have applied to species would, I am sure, produce different results from those here given, when applied to genera.

While, as heretofore stated, the plan has generally been adopted of prefacing the treatment of species in a genus with a specific key, yet in many cases the plan of scattering a key through the specific descriptions has been followed. The result is a lack of uniformity, which at times is disconcerting. This matter, however, is of minor importance and detracts but little from the merits of the work.

So much, then, for the general features of this manual. It now remains for the reviewer to give a statement of the impressions produced on him by various portions of the work.

The treatment of the ferns and fern-allies naturally shows an improvement over the treatment given them in the sixth edition, but one is left wondering what the authors conceive to be the requirements for genera in these groups. Such closely allied genera as *Cheilanthes* and *Notholaena*, *Pellaea* and *Cryptogramma*, and *Asplenium* and *Camptosorus* gain recognition. On the other hand, *Athyrium*, now usually recognized as a legitimate genus, is not given a place in the work, and *Onoclea* and *Woodwardia* are made up of most heterogenous elements. The writer, of course, would not venture even to suspect an element of provincialism in the continued use of *Aspidium*, but does with becoming temerity venture to suggest the expenditure of some of the income from the sale of this work in the purchase of some genuine Dicksonias! Our North American plant so persistently referred to these tree-ferns may then be allowed to take its legitimate position. Again, it may be suggested that while the treatment of *Lycopodium* shows a clear understanding of the New England species, the coastal forms of the *inundatum-alopecuroides* group plainly need further study.

One is glad, indeed, to see *Asplenium ebenoides* definitely characterized as a hybrid, and notes with satisfaction the more numerous family groups now recognized. *Isoëtes* and *Equisetum* have been carefully elaborated by Mr. Eaton, and the resulting arrangement is by far the best we have yet had for these variable and difficult plants. How saddening it is to remember that Mr. Eaton passed away almost simultaneously with the appearance of the results of his labors on the groups he loved so well.

Coming to the monocotyledons, one of the first genera which will strike the reader is *Potamogeton*. The artificial key here produced is apparently a very serviceable one and by not relying too exclusively on winter buds and glands avoids being too technical — a defect which makes Dr. Morong's key so difficult for the field worker to handle. Many changes in nomenclature, too, are made in this group, but these changes as well as the changes required in *Sparganium*, *Sagittaria*, and other genera placed early in the monocotyledonous series will generally commend themselves.

The grasses are handled in a masterly way by Prof. A. S. Hitchcock. He shows no reluctance to recognize recently proposed or revived genera, which commend themselves to his mind, and as a result we have a general arrangement, which will surely be regarded highly by all agrostologists. How greatly altered *Panicum* has become through recent study is shown by the fact that what in the sixth edition was treated as one genus with 25 species and about five varieties has here become six genera with 86 species and four varieties. Other genera, too, show very marked changes, but, of course, nothing like this.

The Cyperaceae also show the influence of new ideas, and in comparing the pages dealing with such genera as *Scirpus* and *Eriophorum* with the earlier editions, one unfamiliar with the recent history of the groups would scarcely believe the two editions represented studies in the same territory. *Carex* has been entirely changed, and very little, if any, of Professor Bailey's earlier treatment survives. A very elaborate and useful but not always accurate artificial key covering fourteen pages is one of the noteworthy features, and the time-honored division into *Vignea* and *Eucarex* is maintained. The statement on page 209, that the distigmatic species of *Eucarex* always have peduncled spikes, is valueless if it includes the terminal spike; and is incorrect, if it refers to the lateral forms of *Carex stricta* and *Carex Goodenovii*, as well as certain species not treated which are exceptions. The treatment of the subgenus *Vignea* is in the opinion of the writer the best ever given our eastern North American species. On the other hand, the treatment of *Eucarex* is less satisfactory, that of *Carex tetanica* and *Carex laxiflora* and their allies being especially weak. To discover errors in the key one might try to name *Carex flava* or *Carex acutiformis* by it.

The remaining groups of the monocotyledons also exhibit in many places the changes made requisite by recent studies. *Juncus* is credited with considerably fewer species disguised as varieties than formerly, and in *Sisyrinchium* the discriminating studies of Mr. Bicknell are rather closely followed. In passing it may be noted that the description of the plant called *Iris hexagona* is evidently based on specimens of the very different *Iris*

foliosa, the former being a tall plant with flowers conspicuously displayed like *Iris versicolor*, the latter a low plant with flowers hidden among the leaves. The treatment of the Orchidaceae is a disappointment, and but two of the views expressed in recent works by Dr. Rydberg are adopted, and these to a very small extent. His views may well not all be correct, but to reject them almost *in toto* is a fairly sure indication that they have not been given the consideration they deserve.

Of the earlier dicotyledonous families, the Salicaceae show the greatest changes and have undoubtedly been the most carefully studied. All the hickories but two receive names under *Carya* different from those in the sixth edition. Again we congratulate the staid Bostonians, as we also do on that pet of the Vienna rules, "*Maclura pomifera*", formed by arbitrarily ruling out Rafinesque's genus *Toxylon*, in favor of Nuttall's later *Maclura*, but recognizing as good Rafinesque's specific name published at the same time as his genus and tacking it on to Nuttall's genus. Verily a case of the tail being better than the head! *Polygonum* shows many changes, the results of Dr. Small's and Professor Robinson's studies being incorporated. Among the smaller genera the treatment of *Asarum* is noticeably deficient.

In general it may be said that so many changes have not been found necessary in the latter half of the work as in the first half, and many more of Dr. Gray's ideas continue to be there incorporated. Several groups, however, in which activity has been great in recent years are entirely changed. Of course, the most noticeable example of this is *Crataegus*, in which Mr. Eggleston, who professedly treats the group in a tentative way only, has done most excellent work. His group divisions apparently represent work of the most thorough character and the species he recognizes represent something more than individual trees. In glancing over the treatment of *Rubus*, however, one feels much inclined to join in the evident opinion of the editors that much more work must be done to understand the genus. It is evident, too, that the different groups of blackberries have been given a very uneven treatment.

Viola shows the result of the long continued and scholarly

study placed upon it by President Brainerd. *Solidago* has been carefully elaborated as far as the New England species are concerned, but the treatment of species not represented in New England is deficient in several respects. Similarly, Dr. Greenman's treatment of eastern *Senecios* is satisfactory, but he has not met so well the difficulties encountered in a study of the southwestern forms. The number of *Asters* recognized has been enlarged from 54 to 59 with many additional varieties; but, even with these additions, there are forms worthy of recognition which are not referred to.

Other features of this interesting work might well be discussed and many specific criticisms made, but space forbids. Omitted species of great distinctness are readily called to mind. Many of these could have been obtained by the authors for examination upon request. The value of the work is lessened and the botanical world has lost because they have failed to make the request. Many synonyms used in recent works are not referred to. But putting these and other points open to unfavorable criticism aside, the writer feels that he has had before him for examination a work of great merit. He has been both pleasantly and agreeably surprised by it, and he feels sure that it will be a welcome addition to the working equipment of all American botanists who are not too strongly committed to the old order of things, — the order exemplified by the sixth edition.

Kenneth K. Mackenzie.

PROCEEDINGS OF THE CLUB

October 13, 1908

The first meeting of the season, held at the Museum of Natural History, was called to order at 8:20 by Dr. Howe in the absence of other officers. Mr. George V. Nash was elected chairman. There were fourteen persons present. The minutes for May 27, 1908 were read and approved. The nominations of Mr. Michael Levine and Dr. Raymond H. Pond for membership in the Club were presented. The resignation of Miss Aurelia B. Crane to

take effect at the end of the present year was read and accepted. The resignation of Dr. C. Stuart Gager as secretary of the Club, occasioned by his removal to the University of Missouri, was read, and accepted with regret, after an expression of the value of his services to the Club. Dr. Pond was elected to membership.

The scientific program consisted of informal reports on field observations by members. Professor F. E. Lloyd was called upon first, and spoke of his recent experiences in Mexico. He exhibited field notes and photographs of cacti collected largely in northern Zacatecas, Mexico; in a restricted region, about sixty species are found. Four species of *Opuntia* are reported to be new; there were no species of *Echinocereus*. Owing to the fact that cacti in conservatories often exhibit very different behavior from that in their natural habitat, the importance of such field study of the group is to be emphasized.

Professor Lloyd then spoke on the bionomics of *Parthenium argentatum*, known in Mexico as guayule. From this plant a large amount of commercial rubber is obtained; the rubber occurs in masses in cells of the pith, medullary rays, and cortex, and is extracted by mechanical means. In addition to reproducing freely by seed, there is an interesting method of vegetative reproduction. The plant has, besides a tap-root system, long and slender horizontal roots near the surface, from which new shoots arise and produce new plants at a distance of a meter or more from the main plant. There may be from two to six of these shoots arising from one point, producing such a different habit that such plants may be easily distinguished from the seedlings with their single trunk. A piece of the stem of *Landolphia*, a tropical liana, was exhibited. In this case the latex coagulates in the canals and the rubber is extracted by mechanical means.

Mr. R. S. Williams spoke briefly of his five months' experience in Panama, particularly on the climatic and soil conditions as affecting vegetation.

Dr. E. B. Southwick exhibited a peculiar monstrosity of *Zea Mays*. Mr. Nash reported the discovery of the rare orchid, *Epipactis viridiflora*, at Letchworth Park.

Adjournment was at 10:05. TRACY E. HAZEN,

Secretary pro tem.

OF INTEREST TO TEACHERS

Biology in Secondary Schools *

By Maurice A. Bigelow

Looking at the problems of high-school biology from the standpoint of the great majority of pupils, not from that of the selected few whose interests or plans may sometimes demand special arrangement of courses, my answer to the Departmental Editor's question, "Should the high-school biology be one based on the conception of biology as a single science, using plant or animal materials as occasion demands for developing principles, or should it be separate sub-courses or entirely distinct courses in botany, zoölogy, or human physiology?" is "yes" for the first part of the question and an emphatic "no" for the second part. And the following considerations point to such a conclusion:

The practical problems of the high-school curriculum, viewed from the standpoint of school administration, demand concentration of the biological work into one course *adapted for the great majority* of pupils. Here are the facts in support of this: (*a*) It is generally admitted that four science courses, one for each year, offer the maximum amount of science desirable for the average secondary-school pupils. (*b*) Chemistry, physics, botany, zoölogy, human physiology, earth science — a total of six — are the sciences which must be taken into consideration. (*c*) There are two possible solutions, namely, election or concentration. (*d*) Election means that pupils will fail to get a broad outlook on the field of natural science, and *possibly of all biology*. (*e*) Concentration of the biological work into one course would leave biology, physics, chemistry, earth science — one for each year of the high school. This looks reasonable from the standpoint of school administration, but is a year in biology satisfactory from the viewpoint of the biologist?

From many quarters we hear the objection that botany and zoölogy have developed into quite separate sciences; and this statement is true in most colleges where research for the few rather

* Reprinted by permission from *School Science and Mathematics*, October, 1908.

than liberal biological training for the many prevails. However, it is now high time that secondary-school teachers of biology begin to distinguish between technical zoölogy and botany viewed as courses leading directly to research and liberal biological courses designated to teach the great ideas or principles of the life sciences with reference to the needs of the average well-educated citizen. Viewed from this standpoint botany and zoology are not properly two sciences. And this is the standpoint which should be taken in secondary schools where the great majority of pupils are completing their formal education rather than preparing for college. More than anything else high-school teachers of biology need to study more seriously the problems of teaching the science with reference to the ideals of liberal secondary education considered as an end in itself rather than as college preparation. Viewed in this way the teaching of biology in the secondary school becomes the selection and presentation *not so much of the facts as of the great ideas or principles* which may be drawn from organized study of a series of plant and animal forms, and the unified course in biology becomes a logical necessity.

But from the four winds comes the protest that botany and zoölogy are so vastly rich in materials that even with a year for each they cannot be "finished." I must confess that I have not been able to get into sympathy with this protest. Why should we want to "finish" botany or zoölogy in one year or even in five, so far as secondary education is concerned? We do not "finish" other subjects in the high school. On the contrary we simply select materials for well-rounded year courses. Certainly we cannot complete a wide survey of either of the biological sciences in a single year, but there are great possibilities of selection when our outlook on high-school science becomes that of liberal education as distinguished from technical education. Take any current high-school book on zoölogy or botany and go through the pages critically questioning each paragraph from the point of view of education for general culture and information, and one is amazed at the amount of matter for which little justification is apparent. Eliminating such material of question-

able value, it seems perfectly feasible to combine the essentials, the great ideas, of the two phases of the science of life into a single course. Such a course with its broader outlook would be more valuable to the average educated citizen than would be either botany or zoölogy studied without reference to its sister science. Even laying entirely aside the practical problems of school administration, which are certainly tending to limit biology study to a single year for the average pupils, I believe that ultimately our high schools will adopt a year course in biology because such a course will best include the important values of biology in secondary education.

The above discussion has included only the information side of the values of high-school biological study. Limitations of space forbid appropriate discussion of the scientific discipline derivable from the study; but I fail to see any valid argument against the year in biology as far as discipline is concerned. On the contrary we may expect to get more valuable scientific discipline from the study of the more important subject-matter which would be concentrated into a year of biology. The possible objections all center around the idea that science study must be carried far into useless detail in order to give the best scientific discipline. This may be true from the research standpoint; but as applied to the everyday life of the average cultured citizen the results of such study of details have been far from satisfying. We seem to be moving rapidly towards that science study which is so correlated with information worth having that the discipline obtained will meet with greater application in practical life.

Summary. — The practical problems of the school curriculum seem to demand a course in biology for the majority of pupils, and there is nothing in the content of the science and in approved methods of teaching which opposes this. Considering the recognized values, a course in biology will tend to emphasize the great ideas or principles worth knowing, and there is no inherent reason why scientific discipline should not be as well developed as in any other high-school course in science.

TEACHERS COLLEGE.

A paper by Dr. Ernst Friedrich, of the German commercial high school at Leipzig, contains the following interesting facts: The world's lumber trade amounts to $285,600,000 annually, of which the United States furnishes about 20 per cent., Austria-Hungary 19 per cent., Russia 16 per cent., Canada 13 per cent., Sweden 18 per cent., and Finland 10 per cent. Great Britain has but 4 per cent. of forest land; France, Switzerland, Italy, Greece, and Spain each less than 10 per cent. Even the newer countries, Chile, Argentine Republic, and Australia are forced to import wood.

The following abstract of a paper on "The Influence of Environment on the Composition of Wheat" by J. A. LeClerc and Sherman Leavitt, has been taken from one of the summer numbers of *Science:*

"Crops grown from the same seed at three points of widely different climatic conditions, such as Kansas, California, and Texas, forming a so-called triangular experiment, and similarly at South Dakota, California, and Texas, showed a marked difference in the protein content, the weight per bushel, the percentage of starchy grain, and total sugar content. Kansas produced invariably a high protein and California a low protein and high sugar content wheat. Wheat grown in California one year was found to double its protein content when grown in Kansas the next; the reverse was found to be true when Kansas seed was grown in California. These differences are due to climatic conditions. The composition of the soil seems to exert no influence on the composition of the crop."

Science for August 14 states that the appropriation for the Department of Agriculture for the present year is over eleven million dollars. The share of this granted to the Bureau of Plant Industry is larger this year, partly because of the boll-weevil work now being carried on. The appropriation for the introduction of rare seeds and plants from foreign countries was increased to $56,000, in addition to the congressional seed distribution, which is to be continued on the usual basis. The

Forest Service appropriation is also larger than last year. "The provisions of the previous year authorizing the extension of the national forests and the giving of advice to owners of woodlands as to their care were eliminated, but authority to aid other federal bureaus in the performance of their duties in respect to the national forests was granted, and advances of money may hereafter be made to chiefs of field parties for fighting forest fires."

Science for October 2 contains an article by Professor Thomas B. Osborne, of the Connecticut Agricultural Experiment Station, on "Our Present Knowledge of Plant Protein." In 1746, Beccari discovered wheat gluten, which was the only form of vegetable protein known for fifty years; after a sketch of the work done in this field from Beccari's time to the present, Professor Osborne states the results of a series of experiments performed in his own laboratory.

About twenty-five different proteins of vegetable origin, all of them the constituents of seeds, have been identified; some few, however, are also found in the active embryo. These have been assigned to the commonly recognized groups established for animal proteins. *Globulins*, or proteins soluble in solutions of neutral salts but insoluble in water, form the greater part of the reserve protein of all seeds except those of the cereals. *Prolamins*, soluble in alcohol and dilute acids but insoluble in water and saline solutions, occur in quantities in the seeds of most cereals but not in other plants examined. *Glutelins*, soluble in dilute acids and alkalis but insoluble in neutral solutions, constitute a large part of the protein of all the cereals and possibly of other seeds. The only known member of this group accessible to satisfactory investigation is the glutenin of wheat which forms nearly one half of the gluten. *Albumins* are present in very small amounts in nearly all seeds. They are more like the protein of animal origin than are the reserve proteins. *Proteoses* in small amounts have been observed in all seeds examined. No phosphorus-containing proteins similar to those which nourish developing animals have been found.

Of twenty-three different seed proteins which have been hydro-

lyzed, all have yielded leucine, proline, phenylalanine, aspartic acid, glutaminic acid, tyrosine, histidine, arginine, and ammonia. A fairly accurate analysis of arginine, histidine, and lysine has been made but not of most of the amino-acids.

The available data indicate a close connection between the chemical constitution of seed proteins and the biological relations of the plants producing them, though no two seeds are alike in respect to their protein constituents.

JANE R. CONDIT.

A GIFT TO TORREYA

A MEMORIAL TO MRS. JAMES MCMANES

As a memorial to Mrs. James McManes, of Philadelphia, her daughter has given to TORREYA the sum of two hundred dollars to be used for illustrations, beginning with the present number. This generous gift will not only make the magazine more attractive in appearance, but, for the coming year at least, will make it possible to secure many interesting papers for which the authors rightly insist upon illustrations.

Mrs. McManes's interest in botany was well known to her intimate friends; and while it did not definitely influence her larger institutional endowments, it was evidenced by such gifts as the giant cycad which for years has attracted the attention of visitors at the University of Pennsylvania.

NEWS ITEMS

At the University of Kansas, F. U. G. Agrelius has been appointed instructor in botany.

Dr. Homer D. House has been appointed associate director in the Biltmore Forest School.

Mr. R. J. H. DeLoach, of the Georgia Experiment Station, has been made professor of the cotton industry in the Georgia Agricultural College.

Mr. George L. Fawcett was recently transferred from the United States Laboratory at Miami, Florida, to the Experiment Station at Mayaguez, Porto Rico.

Mr. R. E. Stone, instructor in botany at the Alabama Polytechnic Institute, has been appointed professor of botany at the University of Nebraska.

Dr. I. F. Lewis, who has been studying at Naples and Bonn, has resumed his duties as professor of biology at Randolph-Macon College, Ashland, Virginia.

The Johns Hopkins laboratory and greenhouse have been completed; the gardens now include about three hundred types of plants illustrating pollination, seed dispersal, plant structure, and vegetative adaptation.

Appointments in biology not previously announced in TORREYA are those of Dr. David R. Whitney as assistant at Northwestern University and Mr. Charles Packard as instructor at Williams College.

Professor Thomas H. Macbride, of the University of Iowa, has been appointed chairman of the Iowa Forestry Commission which will coöperate with the national organization in promoting scientific and practical forestry.

A recent crown commission has outlined a plan for Ireland which proposes planting about 700,000 acres with forest trees. This, with the 300,000 acres of existing forest, would give Ireland 1,000,000 acres of forest land.

Dr. Ernst A. Bessey, pathologist in the United States Department of Agriculture, has been elected to the professorship of botany in the University of Louisiana, at Baton Rouge. He assumed his new duties on October 20.

The following deaths have recently been announced: Dr. Ernst Loeb, botanist, Berlin, aged sixty-six years; Mr. M. D. Clos, director of the botanical garden of Toulouse; Mr. George Nicholson, a former curator of the Royal Gardens at Kew; and Dr. Paul Hennings, curator of the Royal Botanical Museum at Berlin.

Mr. Harry Day Everett, a former student of forestry at Cornell and Michigan and superintendent in the Philippine Forest Service, was murdered by natives in the island of Negros in the early summer. He was twenty-eight years of age.

Professor L. H. Bailey has been given leave of absence from the College of Agriculture, Cornell University, to devote his time to the chairmanship of the commission appointed by President Roosevelt to investigate social and economic conditions of rural life.

At the University of Maine the following appointments have been made: V. R. Gardner, M.S., assistant professor of horticulture; C. E. Lewis, Ph.D., associate vegetable pathologist; M. R. Curtis, M.A., assistant in biology; H. N. Conser, M.S., instructor in botany; E. M. Wallace, B.A., instructor in biology.

Professor Francis E. Lloyd, formerly of Teachers College, has accepted the position of professor of botany at the Alabama Polytechnic Institute. During the past year Professor Lloyd has been engaged in the investigation of the Mexican desert rubber plant, *Parthenium argentatum* A. Gray, for a Mexican rubber company.

The Central University of Equador at Quito desiring to increase its museums invites the correspondence of parties who wish to exchange for collections of Ecuadorian fauna, flora, etc. Those who wish to secure any particular specimen or collection have only to apply to the rector or the secretary of the Central University of Equador at Quito.

An additional construction appropriation of $25,000 for the New York Botanical Garden, was approved in August; it will be expended in continuing the construction of driveways and paths, principally on the eastern side of the grounds, in the completion of the grading operations necessary at the museum building, and in the extension of the system of water-supply and drainage.

The *Pourquoi Pas* left Havre August 16 on a second voyage to the Antarctic regions. Dr. François Charcot, the commander, expects to be absent about two years. The *Pourquoi Pas* will reach the region of southern ice, 800 kilometers south of Cape Horn, at the beginning of the austral summer, about December 15. The marine botanist and zoölogist of the staff is Dr. Jacques Liouville.

The Forest Service, as a result of a recent conference between representatives of the War Department and the Forest Service, has received requests from Fort Mead, South Dakota, and Fort Leavenworth, Kansas, for an examination of the forests at those posts. In 1908 working plans were made by the Forest Service for West Point, thus supplying the post with part of the necessary forest products, such as cordwood, hurdle poles, and tan bark. Similar plans have been made for the military forests at Rock Island, Illinois, at Pecatinny, New Jersey, and at Fort Wingate, New Mexico.

The Hudson River Forest Preserve is discussed by Dr. Edward L. Partridge in *Country Life in America* for September, urging action by the State rather than by the National Government. A bill, he says, will be introduced in the Legislature of New York at its next session to create a Forest Reservation in this region, and he rightly adds that to give an object-lesson in forest reservation no more suitable region could be selected. The proposed bill provides that the State shall exercise a certain forest supervision over an area of more than one hundred and twenty-five square miles through which the Hudson River passes.

The College of Agriculture, Cornell, has planned an "educational special," carrying several members of the faculty of the College of Agriculture, which is to be run on several lines in central and western New York, stopping to allow for forty-five minute talks to the farmers about improved methods of farming. Ten days will be spent on this trip, which is being fully advertized, that the farmers may be prepared to ask questions. According to the New York *Tribune* a similar experiment has been tried this month by the Pennsylvania Railroad Company, representatives of the Pennsylvania State College of Agriculture leaving Philadelphia November 10, for a three-day trip in eastern Pennsylvania.

The corrected program of the Darwin anniversary meeting of the American Association for the Advancement of Science * is practically complete. According to *Science* the papers (which will probably be presented on Friday, January 1) are as follows:

* In the June TORREYA the preliminary announcement was confused with that of the summer meeting of the A. A. A. S. at Hanover.

T. C. Chamberlain: Introductory remarks as president of the association.

Edward B. Poulton: "History of the Theory of Natural Selection since Darwin."

J. M. Coulter: "The Theory of Natural Selection from the Standpoint of Botany."

D. T. MacDougal: "The Direct Effect of Environment."

C. O. Whitman: "Determinate Variation."

C. B. Davenport: "Mutation."

W. E. Castle: "The Behavior of Unit Characters in Heredity."

D. S. Jordan: "The Isolation Factor."

C. H. Eigenmann: "Adaptation."

E. B. Wilson: "The Cell in Relation to Heredity and Evolution."

G. Stanley Hall: "Evolution and Psychology."

H. F. Osborn: "Recent Paleontological Evidence of Evolution."

TORREYA

December, 1908

Vol. 8 No. 12.

RADIOACTIVITY AND LIFE *

BY C. STUART GAGER

1. THE SUPPOSED RADIOACTIVITY OF PLANTS AND OF WOOD

Soon after the discoveries of "contact" electricity and "animal" electricity by Volta and Galvani, plant physiologists began to look for electric currents in plants, and to find therein the explanation of "vital" activity. In a similar manner the announcement of the discovery of radioactivity has been followed by numerous supposed observations of a natural or acquired radioactivity of plants and plant tissues.

Professor A. B. Greene[2] was among the first to report that microörganisms, especially species of *Staphylococcus*, after an exposure of from 24–120 hours to radium rays at a distance of 0.5 mm., themselves exhibit phenomena of radioactivity. He considers it uncertain as to whether living organisms can acquire this property, but states that those killed by the action of radium rays can do so. In his experiments the radium salt was enclosed in a vulcanite and brass capsule, and the radioactivity acquired by the organisms lasted for three minutes after the termination of the exposure, and enabled them to photograph themselves on a sensitive plate. Their spores were found to be best for this purpose.

Lambert[3] stated in 1904 that ferments that digest albuminous matter emit Blondlot rays, and that the emission of these rays is the cause of the action of the soluble ferments.

The experimental demonstration of the emission of the so-

* This article, with the title "*Bio-radioactivity, Eobes, Radiobes*," forms Chapter V of the author's Memoir on "*Effects of the Rays of Radium on Plants*" (Mem. N. Y. Bot. Garden, vol. 4. Dec. 1908), and is reprinted here with the kind permission of the Director-in-Chief of the New York Botanical Garden.—EDITOR.

[No. 11, Vol. 8, of TORREYA, comprising pages 253–276, was issued November 25, 1908.]

called N rays by plants of the garden cress was reported by Meyer.[4] Their emission, he said, varies with the activity of the protoplasm, and is diminished when the plants are exposed to the vapor of chloroform, and is modified by mere compression of the tissues.

In 1904 Russel[5] described before the Royal Society the rather startling discovery of the action of wood on a photographic plate in the dark. This property, he said, belongs probably to all woods. Conifers are especially active, and the spring wood most of all, but the dark autumn wood produced no such effect. Oak, beech, acacia (*Robinia*), Spanish chestnut, and sycamore possess this property, but ash, elm, the horse-chestnut, and the plane tree only to a slight degree. Most resins manifest it, but not so the true gums, such as gum senegal and gum tragacanth. Exposure to sunlight, especially to the blue rays of the spectrum, increases the activity. Cork, printer's ink, leather, pure India rubber, fur, feathers, and turpentine are reported to have their activity increased in the same way. Since bodies such as slate, porcelain, flour, and sugar, in which there is no resinous or allied body, do not react in this way, nor affect the plate at all, the activity of the various kinds of wood is attributed to the resinous substances in them.

Tommasina's[8, 9] papers were also published in 1904. He reported that all freshly gathered plants, fruits, flowers, and leaves possess a radioactivity which is stronger in the young and in individuals in action than in those at rest, being apparently proportional to the vital energy. For this phenomenon he proposed the term *bio-radioactivity*. Buds of lilac, and leaves of *Thuja* and of laurel were found by him to be bio-radioactive.

In the following year Tarchanoff and Moldenhauer[7] published their preliminary note on the induced and natural radioactivity of plants, and on its probable rôle in their growth. When seeds of various grains and of the pea were exposed to the radium emanation, the seedlings growing from such seeds showed induced radioactivity in their roots, but the stem and small leaves remained inactive. Also when a mature plant was exposed to the emanation the roots became strongly radioactive, the stem somewhat less so, the leaves only slightly, and the flowers not at all.

This distribution of the radioactivity in the plant body is constant, and the authors consider that there is in the plant a special substance, sensible to the emanation, and capable of becoming radioactive under its influence. This substance occurs in the roots, but gradually diminishes up the stem. It is found also in seeds. According to this same paper plants possess a natural radioactivity, which is distributed throughout the plant similarly to the induced radioactivity. This natural radioactivity is strong enough to affect a photographic plate, and plays an important rôle in the development of the plant.

In a second paper Russel[6] gives a list of 33 native and 22 foreign woods that are active, and says that the activity of resins and gums is increased by exposure, not only to sunlight, but to the arc-light as well. Photographic plates often contain a negative of the plate-holder. That this is not a case of radioactivity appears to be proved, says the author, for a glass or a mica screen of one thousandth of an inch in thickness entirely protects the plate from being acted on.

Finally Paul Becquerel[1] undertook a careful study of "plant radioactivity." He tested pea seeds, moss (*Hypnum*), and branches of boxwood for radioactivity, but found not a trace of it manifest when the electroscope was carefully guarded from water-vapor. This explains the condition found necessary by Tommasina, that the parts of plants must be freshly picked in order to manifest bio-radioactivity. According to Becquerel, the discharge of the electroscope in Tommasina's experiments was due to the water in the plants.

From all the investigations noted above, the general conclusion seems to be warranted that radioactivity is not a property of protoplasm nor of living tissues. A clear understanding of the nature of radioactivity would lead, *a priori*, to the same inference.

2. The Professed Artificial Creation of Life

Radioactivity and vital activity are in two respects very roughly, but only very superficially analogous. Both radioactive bodies and living organisms are undergoing a destructive process; atomic disintegration in the one, molecular transforma-

tion in the other; both, with exceptions, maintain themselves constantly at a higher temperature than their surroundings. These analogies have in two or three instances proven dangerously attractive.

A consideration of radioactivity led Dubois,[18] in 1904, to the view that the distinction between "matter of life" and "living matter" is superficial. He proposed the term *bioproteon*, meaning the particular state of the "proteon" in living beings, and suggested the desirability of determining the radioactivity proper of the bioproteon. In a subsequent paper[21] he says: "The unique principle of everything, of both force and matter, I have called 'proteon,' and when it pertains to a living being, 'bioproteon'." Proteon and bioproteon are only two different states of the same thing. When the bioproteon is dead it has only ceased to be radioactive and becomes simply proteon. He claimed also to have discovered the emission, from the lamellibranch mollusc, *Phaladea dactyle*, of rays that could penetrate paper and opaque substances and darken a sensitive plate.

Early in the year 1905 appeared his paper[19] on "*La création de l'être vivant et les lois naturelles*" in which he announced the formation of living organisms in bouillon gelatine by placing on it crystals of the bromide of both barium and radium. Later in the same year[20] he claimed to have secured a kind of spontaneous generation by radium. By the contact of certain crystalloids with organic colloids, there are obtained, he says, granulations, or vacuolides, possessing the optical and and morphological characters of simple life, more rudimentary than bioproteon, or living matter. These bodies arise, grow, divide, grow old, and die, returning to the crystalline state like all living things, and Dubois applied to them the generic term *eobe* (dawn of life). Eobes are held to form the transition between the organic and the inorganic world. In his essay[21] on "*La radioactivité et la vie*," he elaborates the hypothesis that the energy irradiated by living beings has two distinct origins — one from the environment, and one ancestral or hereditary. By their "ancestral energy" living beings are similar to radioactive bodies. They both give off heat rays, light, chemical rays, electricity, and possess molecular motion, and atomic and other movements.

Leduc's[25,27] profession to have created life was controverted by Bonnier,[28] Charrin and Goupil,[31] and by Kunstler,[32] in 1907.

The most extravagant claims made in this direction are those of Burke,[12,33] whose observations on the spontaneous action of radioactive bodies on gelatine media form the basis of a voluminous work entitled "The Origin of Life." While these experiments have little of the scientific importance they have been held to possess in the popular mind, it is desirable to state, in Burke's own words, what he did, and his own interpretation of the results.

"An extract of meat of 1 lb. of beef to 1 liter of water, together with 1 per cent. of Witter peptone, 1 per cent. of sodium chloride, and 10 per cent. of gold labelled gelatine was slowly heated in the usual way, sterilized, and then cooled. The gelatine culture medium thus prepared, and commonly known as bouillon, is acted upon by radium salts and some other slightly radioactive bodies in a most remarkable manner."[12]

When the mixture above described was placed in a test-tube and sterilized, and the surface sprinkled with 2.5 grains of radium bromide (activity not given), after 24 hours (three to four days when radium chloride was used), "a peculiar culture-like growth appeared on the surface, and gradually made its way downwards, until after a fortnight, in some cases, it had grown nearly a centimeter beneath the surface." From this growth Burke was not able to make sub-cultures. He considers them not bacteria, and not contaminations, but "highly organized bodies." They have "nuclei", subdivide when a certain size is reached, and "the larger ones appear to have sprung from the smaller ones, and they have all probably arisen in some way from the invisible particles of radium." He regards them as colloidal, rather than crystalline, "of the nature of 'dynamical aggregates' rather than of 'static aggregates'," and coins for them a new name, *radiobes*. This forms the experimental basis for a volume of 351 pages.

With reference to these discoveries, Dubois[23] claims priority over Burke, and rejects his term radiobe in favor of eobe, because these bodies may be obtained with non-radioactive substances.

A few months after Burke's announcement Rudge[24,29] showed

that the alleged growths were "nothing more than finely divided precipitates of insoluble barium salts." He was unable in a preparation similar to the one described by Burke, to observe anything like cell-division, and believes that an occasional grouping of the particles in pairs must be purely fortuitous. The appearance of growth of the radiobes is explained as due to diffusion of the precipitate through the gelatine from a point of concentration where the radium salt was in contact with the gelatine. Salts of barium, lead, and strontium produced effects exactly similar to those caused by radium preparations.

Again repeating Burke's experiments, Rudge[30] was unable to secure the radiobes when agar-agar was substituted for gelatine and distilled water was used. If tap-water was employed a slight growth resulted, while the addition of a soluble sulfate resulted in a very dense growth. An examination of 30–40 samples of gelatine showed that they all contained enough H_2SO_4 to give a distinct, sometimes a dense, precipitate with barium chloride in the presence of HNO_3. This precipitate was found, on analysis, to be $BaSO_4$. Gelatine was then prepared free from sulfates and gave no growth. Negative results were obtained with salts of uranium, thorium, pitchblende, and metallic uranium, thus clearly indicating that there is not the slightest connection between the formation of the rabiobes and radioactivity.

A sample of gelatine from which H_2SO_4 had been removed was sealed with a radium salt from June until September. At the end of that time no growth appeared, but when a soluble sulfate was added to a portion of this gelatine the growth began at once.

"The cellular form of these precipitates," said Rudge, "is probably due to the circumstance that the gelatine is liquefied by the action of the salt, and each particle of precipitate is formed about a core of gelatine, so that the layer of barium sulfate forms a kind of sac or cell which is surrounded by the solutions of the salt in the liquefied gelatine. This 'cell' may be permeable to the liquefied gelatine containing a salt in solution, which, passing through the cell-wall, causes an expansion to take place, the limit of growth being controlled by some surface tension effect."

No trace of a nucleus or of mitosis was observed under the

very highest magnification, and "cells" under a cover-glass sealed down with cement were observed to suffer no alteration during four months.

Reference to the extreme claims noted in some of the literature above cited may be fittingly concluded by the following quotation from Lord Kelvin :[31]

"But let not youthful minds be dazzled by the imaginings of the daily newspapers that because Berthelot and others have . . . made foodstuffs they can make living things, or that there is any prospect of a process being found in any laboratory for making a living thing, whether the minutest germ of bacteriology or anything smaller or greater."

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New York Botanical Garden.

NOTES ON FERNS SEEN DURING THE SUMMER OF 1908

By Ralph Curtiss Benedict

Dryopteris Goldicana × *marginalis* Dowell.

A second locality for this interesting hybrid is to be recorded, the Green Lake region near Jamesville, N. Y., where so many ferns are found. The original collection of *D. Goldicana* × *intermedia* Dowell was made in the same region, and the trip in question had in view the finding of this fern, but it was not secured again although the parent species were seen in abundance and

often in close proximity. Two rather small but fruiting plants of *D. Goldiana* × *marginalis* were found, evidently off-shoots of a single original plant. The plants are now growing at the New York Botanical Garden where they will not only have good conditions for growth, but will also be protected from chance injury by cattle, or careless or ignorant collectors. It is suggested that rare hybrids constitute a type of plant which it is advisable always to protect by transplanting if proper care can be given them, since otherwise a locality may easily happen to be lost or destroyed.

Dryopteris simulata Davenport.

Two localities are here reported which it is believed extend the range considerably, at least in New York state.

At Quiver Pond, about one quarter mile south of the central part of Fourth Lake, Herkimer County, N. Y. The fern grew here in abundance, forming dense clumps on the higher portions of a sphagnum swamp. A few scattered plants of *D. Thelypteris* were also seen, but apparently it did not thrive there as well as its less common relative.

A second locality was noted at Horseshoe, St. Lawrence County, where the fern grew in a situation similar to that at Quiver Pond. So far as the writer knows the only previous collection north of the lower part of the state is that of H. D. House near Oneida Lake, and the occurrence so far to the north suggests that the fern may eventually be found in Canada. It is likely, too, that it will prove to be much commoner than has been supposed.

Dryopteris dilatata (Hoffm.) Gray.

On Blue Mt., N. Y., from about 3,000 feet to the summit. This find was of particular interest to me as it was my first opportunity to see this fern in its natural habitat. Its range was overlapped for perhaps two or three hundred feet (in altitude) by *D. intermedia* (Muhl.) Gray from which, however, it could easily be distinguished in size, shape, and texture. *D. spinulosa* (Müll.) Ktze., which in this country is usually considered to include the two preceding, was not seen at all.

The use of the binomial *D. dilatata* is in agreement with a common practice in Europe, and has been supported, and rightly as it seems to me, by many well-known fern students. *D. intermedia* (Muhl.) Gray, which does not occur in Europe, I believe to be similarly distinct, and hope later to give sufficient reason for this opinion.

Osmunda cinnamomea L.

Two aberrant forms of this species were noted during the summer. The first was a physiological freak, apparently a variant from the *frondosa* form which is known to occur on burnt-over land, as was the case at the locality in question, a roadside swamp in the town of Cornwall, Ct. The peculiarity of the *frondosa* form is the replacement of some of the fertile pinnae by green vegetative ones so that a single frond shows both sorts. In the present instance, the *frondosa* form was not seen but apparently the same result, an increase of the vegetative tissue, was attained. The fronds appeared strongly crested owing to a more or less irregular enlargement of the pinnulae which, besides being expanded and curled, were mostly deeply dentate. Few fertile fronds were seen.

The other form was first found by Miss Harriet Mulford near Hempstead, Long Island, where several plants were seen. Later I found two plants in the Cornwall swamp above mentioned. The peculiarity in this consisted in an excessive development of the lower basal pinnulae which in many cases were at least half as long as the pinnae themselves. As the fronds were nearly erect, and the pinnae about horizontal, the effect was to give the fronds a thick plumy appearance, making the plants exceptionally attractive from a horticultural standpoint.

Columbia University.

THE CEDAR OF LEBANON*

BY MARY PERLE ANDERSON

Religion, poetry, and history have all united to make famous the cedars of Mount Lebanon. Again and again they have been visited by the pilgrim, by the distinguished traveller, by the man of science. Grave doubts exist, however, as to whether the tree now known as the cedar of Lebanon, *Cedrus Libani* Barr, is the one so frequently mentioned in the Old Testament, for these cedars occupy a lofty and isolated position. They are twenty miles from the coast, in a rocky mountain valley at a height of six thousand feet on the side of Mount Lebanon, and about four thousand feet from its summit. Therefore they could have been transported to Jerusalem only with the greatest difficulty and expense. The wood, too, is inferior in color and durability to the wood of the more common cypress and juniper, and it is probable that one or the other of these more easily accessible trees was used for building purposes in the days of Solomon.

The botanical history of the cedar of Lebanon is less varied than that of many humbler plants. Tournefort called it a larch; Linnaeus, a pine; Poiret, a spruce. Dodonaeus named it *Cedrus magna*, and in 1714, Barrelier gave the tree its present name of *Cedrus Libani*.

During the sixteenth century it became so much of a custom to make a pilgrimage to the cedars of Mount Lebanon that it was necessary to take steps for the preservation of the trees, for the pious pilgrims carried away much wood for the construction of crosses and tabernacles. In this the Maronites were more successful than we of the present day in our efforts to preserve our forests and native wild flowers. They issued an edict threatening excommunication to all who should injure the trees. Not even a branch was allowed to be cut except once a year, when, on the eve of the Transfiguration, a festival known as the Feast of the Cedars was held, and an altar was built under one of the largest and oldest of the trees.

From the middle of the sixteenth century, we have the records

* Illustrated with the aid of the McManes fund.

of many famous travellers and scientists who visited the cedars. In 1550, Belon reports the number as twenty-eight, and says, "No other tree grows in the valley in which they are situated;

The Cedar of Lebanon in the Jardin des Plantes, Paris.

and it is generally so covered with snow as to be only accessible in summer." In 1574, Raiewolf gives the number as twenty-six, but adds, "There are two others the branches whereof are quite

damaged for age. I also went about in this place to look for some young ones but could find none at all." In 1655, Thevenot said that there were twenty-three trees, and a half century later a reliable witness writes of the cedars, "Here are some very old and of prodigious bulk, and others younger and of a smaller size. Of the former, I could reckon up only sixteen, the latter are very numerous."

In 1722, La Roque tells us that the largest of the trees had a trunk nineteen feet in circumference and a head one hundred and twenty feet in circumference. In 1744, Pococke says there are "fifteen large ones and a great number of young cedars." In 1829, Pariset writes, "There are not above a dozen large trees, but there may be 400–500 small ones," and in 1832, there is a note of pathos in Lamartine's simple statement, "There are now but seven large trees."

In the autumn of 1860, J. D. Hooker visited the famous trees and in the November number of the *Natural History Review* of the year 1862, gives a fuller account of them than his predecessors. In this article, we read that on the side of the mountain, the cedars "appear as a black speck in the great area of corry and its moraines, which contain no other arboreous vegetation, nor any shrubs, but a few small berberry and rose bushes, that form no feature in the landscape. The number of the trees is about four hundred; they form a single group about four hundred yards in diameter with one or two outstanding trees not far from the rest. They are disposed in nine groups corresponding to as many hummocks of the moraine on which they occur." With regard to number, Hooker says that there were only fifteen trees above fifteen feet in girth and only two others above twelve feet. As to size, they varied from eighteen inches to forty feet in girth. He himself says that it is a significant fact that there was no tree of less than eighteen inches girth, not even seedlings of a second year's growth.

The above records seem to indicate that conditions favorable for the germination and growth of new trees come only at long intervals in this isolated valley on the side of Mount Lebanon. What the conditions are that govern the increase of population

among these aristocratic and exclusive trees, and keep the number limited to the "four hundred" is a problem difficult to solve.

The date of the introduction of the cedar of Lebanon into England is not surely known, but Aiton in the Hortus Kewensis of 1838 places it in 1683, the date of the planting of the trees in the Chelsea Botanic Gardens. These trees first produced cones in 1766, and since that date, the tree has been largely planted on the great estates and in the stately parks and pleasure-grounds throughout England. The English climate furnishes conditions most favorable for its growth and to-day there are thousands of noble specimens with wide-spreading branches that add a grandeur and dignity to their environment that is too often wanting in our American parks which seem young and frivolous by comparison.

At Warwick there are many beautiful examples of the cedar of Lebanon. They lend their gracious dignity to the sturdy oaks and Scotch firs about them, and even the peacocks roosting in their branches lose their vain and silly airs and become transformed birds. Within the castle, there is a great room known as the Cedar Room. It is panelled from floor to roof with the rich dark red wood of the cedars grown on the estate, and "hewn and carved by men of Warwick during the last century," according to the guide who shows one about.

The cedar was introduced into France in 1734 when Bernard de Jussieu brought from London two plants, so small, that to preserve them more securely, he is said to have carried them in his hat. Just why the simple fact that he carried them in his hat should so have taken hold of the popular imagination is hard to explain. The theme, however, has been repeated again and again and with ever widening sweeps and variations. Long since the tale escaped from the realm of fact and soared into the high thin air of fiction. Perhaps it reaches its culmination in the second volume of "The Forest Trees of Great Britain" by Johns. When we consider that the facts of the case are all presented in the few words at the beginning of this paragraph, we are prepared to enjoy the frolic that results when imagination is let loose on botanical grounds. This is the touching tale of Jussieu and his hat and the cedar of Lebanon as presented by Johns:

"Many years ago a Frenchman, who was travelling in the Holy Land, found a little seedling among the Cedars of Lebanon, which he longed to bring away as a memorial of his travels. He took it up tenderly, with all the earth about its little roots, and, for want of a better flower-pot, planted it carefully in his hat, and there he kept it and tended it.

"The voyage home was rough and tempestuous, and so much longer than usual, that the supply of fresh water in the ship fell short, and they were obliged to measure it out most carefully to each person. The captain was allowed two glasses a day, the sailors who had the work of the ship on their hands, one glass each, and the poor passengers but half a glass. In such a scarcity you may suppose the poor Cedar had no allowance at all. But our friend the traveler felt for it as his child, and each day shared with it his small half glass of precious water; and so it was, that when the vessel arrived at the port, the traveller had drunk so little water that he was almost dying, and the young Cedar so much that, behold, it was a noble and fresh little tree, six inches high!

"At the custom-house the officers, who are always suspicious of smuggling, wished to empty the hat, for they would not believe but that something more valuable in their eyes lay hid beneath the moist mould. They thought of lace or of diamonds, and began to thrust their fingers into the soil. But our poor traveler implored them so earnestly to spare his tree, and talked to them so eloquently of all that we read in the Bible of the Cedar of Lebanon, telling them of David's house and Solomon's temple, that the men's hearts were softened, and they suffered the young cedar to remain undisturbed in its strange dwelling. From thence it was carried to Paris, and planted in the Jardin des Plantes."

The two trees brought by Jussieu from London lived and flourished. One was planted in the Jardin des Plantes, and the accompanying illustration shows it as it appears to-day, stately, symmetrical, and graceful, dominating that portion of the garden where it grows. The other tree is said to be even larger and more beautiful; it was planted at the Chateau de Montigny, near Montereau.

In the beautiful pleasure-grounds of St. Cloud, there is a group of younger cedars that were planted by Marie Antoinette. They have not yet lost their lower branches and so present a habit quite different from that of the mature tree.

When the cedar of Lebanon was first introduced into the United States is not known. In 1849, a specimen fifty feet high in the grounds of Mr. Ash at Throggs Neck was considered the finest in the Union. Unfortunately the climate of New England is too severe and changeable, and that of the Middle Atlantic States is not entirely favorable for its growth. It is hardy only in the South and in California.

In Central Park, in the vicinity of Eighty-fourth street, there is a promising specimen of the cedar that in habit resembles the cedars of Marie Antoinette. It is by the walk along the reservoir on the side towards the bridle path. In Prospect Park, Brooklyn, there is another young tree. There are older specimens in Flushing, and in Princeton ; in Philadelphia, in the arboretum of the Painters, there is a fine cedar that was planted at some time between 1840 and 1850.

Although the cedar of Lebanon may not be hardy with us, it is a matter for regret that since some attempts have proven successful, more efforts have not been made to cultivate this tree which would add a new element of beauty to our parks and gardens.

Two closely related cedars are proving better adapted to our climate : *Cedrus Deodara*, the Indian cedar, with its pendulous branches, and *Cedrus atlantica*, the Mount Atlas or Himalayan cedar, with rather erect branches. Of the two, the latter is the more hardy in this country. While both are desirable, neither can compete with *Cedrus libani*, the cedar of Lebanon, with its wide-spreading horizontal branches weighted with tradition and poetry.

HORACE MANN SCHOOL,
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REVIEWS

Urban's Symbolae Antillanae

The fifth volume of Professor Urban's valuable contributions to West Indian botany, published under the above title, has recently been completed by the publication of its third fascicle, and forms a volume of 555 pages. It includes a continuation of the bibliography of West Indian botany, written by Professor Urban, a monograph of the genus *Smilax* by O. E. Schulz; one of the family Celastraceae by Professor Urban; the Sapotaceae by M. Pierre and Professor Urban; Olacaceae by Professor Urban; Erythroxylaceae by Mr. Schulz; descriptions of new Compositae, and of a large number of new genera and species by Professor Urban. The work is thoroughly indexed.

These studies are of the highest importance to American botanists, and are throwing a flood of light on the relationships of West Indian plants. A very large number of species and genera new to science have been described, and many species incorrectly understood by previous authors have been elucidated, and their descriptions perfected. Much care has been taken to consult type specimens of the older authors and the amount of close study which the investigation has called for is very great; Professor Urban has the gratitude of American botanists.

Volume 4 of the Symbolae, given wholly to the flora of Porto Rico, is as yet uncompleted, two parts having been published several years ago. It is earnestly hoped that Professor Urban will soon be able to finish this volume, inasmuch as it will form a point of departure for all subsequent work on the flora of that island. It is a list of species with descriptions only of novelties, and no keys or other methods of determination are given; but a Porto Rico flora available for use by others may readily be prepared, using Professor Urban's work as a basis.

N. L. Britton

PROCEEDINGS OF THE CLUB

October 29, 1908

The meeting was called to order at the New York Botanical Garden at 3.30 P. M., Dr. M. A. Howe being asked to take the chair. The minutes of the meeting of October 13 were read and approved. Mr. Michael Levine was elected to membership. Mr. Percy Wilson was elected secretary.

A microscopic preparation of the red snow plant, *Sphaerella nivalis*, collected this autumn on Cape York, was exhibited by Dr. N. L. Britton, who received it from the secretary of the Peary Arctic Club. Dr. Tracy E. Hazen gave a brief description of this interesting plant and raised certain questions still unsolved concerning it.

The first subject on the published program was "A Recent Collection of Mosses from Panama," by Mr. R. S. Williams. The following synopsis of this paper was written for the secretary by Mr. Williams:

"For the time spent in the field this was much the smallest collection of mosses ever made by the speaker. It may be accounted for partly by the fact that most of the work was done in the latter part of the dry season, namely, during the last week of February, through March, and about three weeks of April, and partly because of the low level, mostly under 300 feet elevation, at which much of the collecting was done.

"In the city of Panama are a number of fine old ruins more or less overgrown with shrubs and smaller plants but not a single species of moss was observed. On going to Penonome, some hundred miles west of the Canal Zone on the Pacific coast, the conditions were found to be much the same. One species of moss, however, was found abundantly fruiting in a cultivated field of cassava. This was *Bryum coronatum* Schwaegr., a world-wide species of the tropics and occurring as far north as Florida. On going a few miles back of the town, among the foothills and low mountains, various mosses become not uncommon, growing chiefly on trees, but even here very few species were obtained in

anything like good fruiting condition. On leaving Penonome a trip was made southeast of the canal along the Pacific coast about 100 miles to the Gulf of San Miguel, and up the Tuira river about 70 miles into the the interior to the mining camp of Cana. Here much more favorable conditions were found, Cana being situated at an altitude of 2,000 feet above the sea with the Espirito Santo mountains just back of the town, rising 5,000 feet higher. Mosses and liverworts were fairly abundant and at a more favorable season doubtless a large collection might be made.

"Of the 30 species brought back from both sides of the Canal Zone, five sixths are known to be South American. Two of these, *Pilotrichum amazonum* Mitt., collected originally by Spruce on the Amazon, and *Lepidopilum brevipes* Mitt., found by Spruce in the Andes at 3,000 feet, had not been since reported by any other collector. The five remaining species appear to be unknown outside of Central America. They are *Syrrhopodon Bernoullii* C. M.; a species belonging to the very large genus *Macromitrium*, apparently undescribed; a species of *Cryphaea*, also undescribed, and bearing numerous propagula on the stems; *Porotrichum cobanense* C. M. and *Cyclodictyon Liebmanni* Schimp., these last two being previously known only from the type localities."

The second paper, "The Morphology of *Taenioma*," by Miss Elizabeth I. Thompson, was not read, as Miss Thompson was absent.

Dr. N. L. Britton gave a brief account of *Rhipsalis*, a genus of the Cactaceae whose members are pendulous from tree trunks or rocks. Most of these plants occur in Tropical America, but a few species, strange to say, are found in tropical east Africa. Of the fifty-three species that have been recognized, the speaker discussed chiefly those of Mexico, Central America, and the West Indies, illustrating his remarks with herbarium specimens.

Dr. Tracy Hazen described in detail an interesting phase in the development of a species of *Chaetophora* found in the brook flowing through the herbaceous valley of the New York Botanical Garden. This investigation is, however, not yet complete. Dr. Hazen stated incidentally that the algal flora of this brook appeared to be considerably richer now than it was a few years

ago; and a discussion followed as to the presence of additional forms, some attributing it to insects, frogs, and other minor aquatic animals, and others to the wild ducks that frequent this brook through the summer season.

W. A. Murrill,
Secretary pro tem.

November 10, 1908

The Club met at the American Museum of Natural History and was called to order by Vice-President Burgess at 8:15 P. M. About 95 persons were present.

After the reading of the minutes of the meeting of October 29, Dr. N. L. Britton delivered the lecture of the evening on "Trees of the Vicinity of New York". The lecture was illustrated by lantern slides from the Van Brunt collection and was of a popular nature. The trees were taken up in a biological order, beginning with the gymnosperms, and the photographs exhibited illustrated both the general habit of the trees discussed and details of their flowers and fruit.

Marshall A. Howe,
Secretary pro tem.

OF INTEREST TO TEACHERS

The Camera Lucida for Class Demonstration

By Robert Greenleaf Leavitt

So far as I have seen, the use of the camera lucida for purposes of demonstration with classes, as now to be described, has not heretofore been put into print; though it is altogether likely that others beside myself have hit upon the device. The idea first occurred to me when showing visitors at the laboratory the workings of the compound microscope. The camera lucida always greatly pleases the uninitiated by its magical power of bringing the pencil into the field of the instrument, and of instantly conferring upon the novice the skill of the draftsman. It occurred to me, while exhibiting under the microscope and explaining some of the objects one usually shows to these people, such as algae or stained

sections of vegetable tissues which are not immediately comprehended by laymen, that by leaving the camera lucida in place I could point out to the observer the parts referred to in my attempted explanations. I fixed a paper upon the table top under the camera, hastily drew faint outlines of the objects in the field, and then, as my visitor gazed through the microscope, pointed with the pencil to these outlines, or, as the observer believed, to the various details within the scope of his vision.

When microscopes are to be used for demonstrating to classes illustrative material after lectures, or for brief examination of special preparations, by students in rotation during periods of general laboratory practice, the same method may advantageously be adopted. A not uncommon custom is to supply each microscope with a rough drawing, or with an illustration in an open book or on a chart. In the present method each microscope is provided with a camera lucida. Instrument, preparation, and paper are secured in place. The instructor adjusts things, and upon the paper in their proper positions writes the names of parts to which attention is to be directed, or places marks of indication, which afterwards to the students appear as labels in the preparations themselves.

State Normal School,
Trenton, New Jersey.

The *Outlook* for November 28 prints the following appeal from one of its readers: "Would it perhaps be timely to ask your readers if, after the terrible forest fires of this summer and autumn, it might not be considerate to refrain from using trees for Christmas decorations? Thousands of evergreens must be sacrificed annually to meet the demands of the Christmas trade. Is it a custom worthy of being perpetuated?"

The *Boston Herald* states that one New Hampshire neighborhood is to furnish about 10,000 Christmas trees for Philadelphia. Several acres of young woodland is to be stripped of fine, young spruce trees, for which the owners will receive no more than six or seven cents each. The *Herald's* correspondent further says the "trees are sacrificed for only a few hours' enjoyment, and

the people in this locality are deploring the denuding of the land on this account."

The *Outlook* also prints a letter from Mr. Alfred Gaskill, state forester of New Jersey. It runs as follows:

"It is sometimes difficult to be patient with those who urge the abolition of Christmas greens for the sake of the forests. To what better use can a tree be put than to gladden half a dozen, or half a thousand, child hearts on Christmas Eve? Is the lumber from a whole forest worth one telling of the legend of the *Weihnachtsbaum?* But the hope expressed in your issue of November 28 that there may be a way to have Christmas trees and forests too leads me to say that the fears of those who love the forests more than the children, or at least seem to do so, are groundless. If every family in this land had a fifteen-year-old Christmas tree every year, they could all be grown without difficulty on a third of a million acres, or less than one seventh of the forest area of this little State of New Jersey. Of course the cutting of trees as now carried on in Maine and elsewhere looks destructive, and often is destructive, yet the trouble is not with the business but with the way it is conducted. In other words, Christmas tree growing can and should be a regular industry. The trees can come in part from necessary thinnings in lumber stands, in part from plantations made for the specific purpose. It is quite as legitimate to plant a piece of land with balsam for Christmas trees as with peach trees. Both kinds will be cut down at about the same age. Several property-owners in this State are definitely planning to grow Christmas trees on land that is now yielding no valuable crop. The planting will convert ugly brown slopes to hills of green, for some years at least, and the venture promises to be a paying one.

"With respect to greens the case is not very different. The supply now comes mainly from waste places and is gathered by poor people who get their Christmas in that way. Holly is a most beautiful tree and its wood is valuable, yet scarcely a specimen found north of Virginia would yield as much in lumber as in greens. Laurel, or Kalmia, is the most generally used woody plant, and that use, too, ought to be legitimate. There is no de-

fense of the practice of stripping fence rows and park woods, and it should be stopped. But laurel is a forest weed; it interferes with the development of young trees and is a nuisance where silviculture is practiced. We have in this State an area of 15,000 or 20,000 acres on which 'nothing of value will grow — only laurel and scrub-oak.' I do not know who owns this land, but I do know that the glory of the flowers in June does little toward paying taxes, and I am quite sure that any one who wants to gather greens there will find little objection.

The problem of Christmas greens, if it be a problem at all, can be solved by the simplest measures of control. Restrict cutting of trees or shrubs where the act will cause a disfigurement, but encourage the use of all the evergreen plants, and their propagation, as a means of making the earth more fruitful. Trees are for use, and those who would save every tree must be reminded that mere saving is waste. The wise, the necessary thing is to make them satisfy the needs of man; some for an hour's delight at Christmas time, some for warmth and shelter, all to delight the eye and cheer the heart until the time for sacrifice comes.

Change of sex in plants is the subject of an article by Mr. M. J. Iorns, of Porto Rico, in *Science* for July 24. The following is quoted in part only: "While change of sex among the phanerogams is not unknown yet it is of such rare occurrence that any well-demonstrated instances as those shown by the Caricas under observation are worthy of careful study. This is especially true when that change can be brought about by cultural methods as seems to be clearly proved in the present instance.

"*Carica papaya* is a tropical, rapidly growing tree-like form belonging to the Passifloreae family. As found in Porto Rico it is distinctively dioecious, the monoecious form being very rare except when produced as were the ones under observation. The tree is non-branching, but will readily develop lateral buds if the terminal bud is destroyed." The staminate flowers "developed successively, continuing over a long period of time, so that there is no time during the year when flowers are not shedding pollen. The pistillate tree bears axillary flowers of a very different form

from the staminate" which are borne on an unbranched peduncle usually varying in number from one to five. "Of these only one, with rare exceptions, sets fruit. It is said that the flowers are sometimes perfect, but such have not come under my notice as yet. The fruit varies in form from oval to a distinctively necked pear shape and in weight from three pounds to ten pounds or even more. The fruit in some varieties is very delicious and has many medicinal properties ascribed to it, so that the plant is of enough value economically aside from its botanical interest to be worthy of careful study.

"The change of sex in the first tree noted was brought about accidentally. A staminate tree of some age had its terminal bud accidentally injured. The staminate flower clusters produced shortly afterwards contained pistillate flowers in the terminal group. These flowers set and developed good-sized fruits."

The natives stated that the "removal of the terminal bud in the new of the moon would usually cause this transformation. Other trees growing on the grounds were at once set aside for experimental purposes and the tops were removed at different phases of the moon to disprove the moon's having any effect and also to show, if possible, what were the necessary conditions, if any, outside of the mere removal of the terminal bud. Thus far it is clearly shown that the removal of the terminal bud does cause the change, but also that some other condition is necessary, as only a part of those thus treated have thus far developed any pistillate flowers. The moon's phase does not appear to have any control, though, strange to say, those treated at a fairly definitely recurring period are the ones that show change. It is possible that the plant has definite short cyclic periods of growth and that it is necessary to remove the tip at some definite phase of this cycle in order to produce the development of fertile flowers. If this be true and this cycle should accidentally coincide fairly well with the moon's phases, the belief in moon influence would naturally arise.

"This view of an approximately monthly periodic cycle of growth has several things to support it. The chief of these is found in continuous development of flowers and fruit. At no

time during the year were the trees under observation without both flower and fruit. On the other hand, there are times when growth is more rapid, more flowers are developed and the terminal nodes elongate much more rapidly. The exact time of these periods has not yet been determined definitely, but data are being collected.

"The habit of the plant is being closely studied to determine the characteristics of each change and at what point in this growth the tips must be removed to produce the changes under discussion. It is possible that the power to produce pistillate flowers is inherent in the plant, being dormant unless some shock is given to destroy the equilibrium of the growth forces. This inherent quality is indicated by the fact that in some countries the plants are sometimes found naturally monoecious."

NEWS ITEMS

Kohang Yih, of China, is investigating the tobacco industry in the United States.

Oberlin College has recently received from Mrs. Mary F. Spencer a collection of several thousand European plants.

The Yale Forest School has recently acquired a thousand more acres at the reservation near Milford, Pennsylvania.

The Transvaal is planning an agricultural college; Dr. F. M. Smith is here making a study of American management.

Dr. J. E. Kirkwood, formerly of Syracuse University, is now at the Tucson Desert Botanical Laboratory engaged in research work.

Dr. Carl L. Alsberg, of the Harvard Medical School, has resigned to conduct the Department of Agriculture investigations on poisonous plants.

Mr. W. S. Harwood, of California, the author of "New Creations in Plant Life, or Life and Works of Luther Burbank," died in November.

Dr. Shigeo Yamanouchi, assistant in botany in the University of Chicago, is spending three months at the marine biological station at Naples.

Professor Charles R. Barnes and Dr. W. J. G. Land, of the University of Chicago, are in Mexico collecting research material, principally mosses.

The National Conservation Commission after six months' work held a meeting in Washington early in December to prepare the report requested by President Roosevelt.

Mr. Joseph H. Painter, aid in the Division of Plants of the U. S. National Museum, met death by accidental drowning in the Potomac River, December 6.

The Bartram Association has placed in the charge of Professor Macfarlane, of the University of Pennsylvania, the annual planting of a new tree in the Bartram gardens.

An American table is again being supported by Columbia University at the Naples biological laboratory. Applications may be sent to Professor E. B. Wilson at Columbia.

Dr. William A. Murrill, assistant director of the New York Botanical Garden, sailed for Jamaica on December 5. He plans to spend five or six weeks in collecting the fungi of the island.

Dr. Roland M. Harper has accepted a position with the Florida State Geological Survey, with headquarters at Tallahassee, and will be engaged during the winter in studying the origin, classification, distribution, and extent of the peat deposits of that State.

Beginning on December 28, the New Jersey State Board of Agriculture will give a six-day course for farmers at the Agricultural College in New Brunswick. About nine lectures are to be given each day on such varied subjects as farm manures and fertilizers, stock breeding, orchard and fruit trees, injurious insects, seed testing, and plant breeding.

The New York Academy of Sciences will observe Darwin's birthday, February 12, 1909, by presenting to the Museum of Natural History a bronze bust of Darwin and holding appropriate exercises, which will include an exhibition of material illustrating Darwin's theory of evolution and also indicate the range of his scientific work.

The Baltimore meeting of the American Association for the Advancement of Science, which begins December 28, includes, besides the sessions of the Section G, Botany, meetings of the following societies: American Federation of Teachers of the Mathematical and Natural Sciences, the American Society of Biological Chemists, the Botanical Society of America, Sullivant Moss Chapter, and Wild Flower Preservation Society.

Some weeks ago at the Chicago meeting of the board of trustees of the Marine Biological Laboratory at Woods Hole, measures were taken to institute a central board composed of representatives from the various stations engaged in marine work. Fourteen biological stations are at present included. Professor N. L. Britton (of the Torrey Club) represents the Cinchona Station of the New York Botanical Garden.

The new field organization of the Forest Service is well under way. The 377 foresters, clerks, and stenographers who are to make up the personnel of the service have been assigned to the six offices previously announced: Denver, Colo., Ogden, Utah, Missoula, Mont., Albuquerque, N. Mex., San Francisco, Cal., and Portland, Oreg. Much of the national forest business which formerly was transacted in Washington will now be handled by officers on or near the ground, which is a distinct improvement.

Mr. J. G. Lemmon, a pioneer botanist of California, died at his home in Oakland, November 24, aged seventy-six years. He served in the Civil War, came to the high Sierra Nevada to recuperate his shattered health, and under the inspiration of Asa Gray, collected plants and distributed widely his specimens, many of which represented species described as new by the botanical staff at Harvard. He was California State Forester from 1886 to 1890 and the author of numerous papers concerning west American trees.—W. L. Jepson.

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New names and the names of new genera and species are printed in **boldface type.**

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